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(71)Applicant : **SONY CORP**
(72)Inventor : **TAWARA KATSUMI**
KITAMURA TAKUYA
MIHARA KANJI
MURAKAMI YOSHIHIRO

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(54) **DECODING DEVICEMETHOD THEREFOR AND PROVIDING MEDIUM**

(57)Abstract:
PROBLEM TO BE SOLVED: To make a scale of transcoder small and to suppress the deterioration of images cauged by re-encoding.
SOLUTION: An encoding parameter multiplex device 103 multiplexes a present encoding parameter and an encoding parameter of plural generations included in history informationwhich is supplied by a history encoder 104 into video data supplied bay a decoder 102 and outputs it as a digital video signal of a base band to an encoding parameter separation device 105. The encoding parameter separation device 105 selects the encoding parameter to be used for encoding by an encoder 106outputs it as the present encoding parameter to the encoder 106and outputs the remaining encoding parameter of plural generations to a history encoder 107. The encoder 106 encodes the video data supplied by the encoding parameter separation device 105 by the present encoding parameter and generates a bit stream; at the same timeit multiplexes use data where the encoding parameter of the plural generations supplied by the history encoder 107 to the bit stream is included as history informationand outputs them to a successive step transcoder.

CLAIMS

[Claim(s)]
[Claim 1]A decoding device which decodes a bit stream coded based on an MPEG standardcomprising:
A hysteresis information decoding means which decodes coding hysteresis information in the past coding processing inserted in user data area of a picture layer of said bit stream.
A video-data decoding means which decodes a video data from said bit stream.

[Claim 2]A decoding method of a decoding device which decodes a bit stream coded based on an MPEG standard characterized by comprising the following.
A hysteresis information decoding step which decodes coding hysteresis information in the past coding processing inserted in user data area of a picture layer of said bit stream.
A video-data decoding step which decodes a video data from said bit stream.

[Claim 3]A distribution medium providing a program which a computer characterized by comprising the following which performs processing can read.
A hysteresis information decoding step which decodes coding hysteresis information in the past coding processing inserted in user data area of a picture layer of said bit stream to a decoding device which decodes a bit stream coded based on an MPEG standard.
A video-data decoding step which decodes a video data from said bit stream.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]About a decoding devicea methodand a distribution mediumespecially this invention records a dynamic image signalfor example on recording mediasuch as a magneto-optical disc and magnetic tapeand plays thisIn [display on the display etc. in which stereo ** is possibleor a video conference systema video telephone systemthe apparatus for broadcastetc. transmit a dynamic image signal to a receiver from the transmitting side via a transmission lineand] a receiverIt useswhen receiving and displaying thisand it is related with a suitable decoding devicea methodand a distribution medium.
[0002]
[Description of the Prior Art]For examplelike a video conference system and a video telephone systemin the system which transmits a dynamic image signal to a remote placein order to use a transmission line efficientlythe line correlation and inter frame correlation of a video signal are usedand compression encoding of the picture signal is carried out.
[0003]When compression encoding of the picture signal is carried outcoding is performed so that the bit stream generated may become the predetermined bit rate. Howeveron account of a transmission lineit may be necessary to change the bit rate of a bit stream on actual operation. In such a casethe method of coding again is common so that the information coded may once be decoded and the bit rate may become a predetermined value by the transformer coder 131

as shown in drawing 68. In the case of the example of drawing 68the bit stream sent by 10Mbps is decoded by the decoding device 132and is supplied to the coding equipment 133 as a digital video signaland the bit rate is coded and outputted to the bit stream which is 5Mbps by the coding equipment 133.

[0004]

[Problem(s) to be Solved by the Invention]Thuswhen recoding of the video signal was carried outas shown in drawing 69the motion detection part 134 which detects the line correlation and inter frame correlation of a video signal was needed for the coding equipment 133and there was SUBJECT to which the scale of the coding equipment 133 becomes large in it.

[0005]It is better for the picture information of a frame to be independently with the picture information of other framesfor example at a broadcasting stationsince edit of an image is performed by a second bit. Thenso that image quality may not deteriorateeven if it transmits by the low bit rate (3 thru/or 9Mbps)as shown in drawing 70The bit stream outputted from the coding equipment 133-1 of Long GOP with many frame numbers which constitute GOP (Group of Picture) which is a set of the frame which has information in correlationThe frame number which constitutes GOP with the coding equipment 133-2 of a broadcasting station is changed into little Short GOPis transmitted with a high bit rate (18 thru/or 50Mbps)and is again changed and outputted to Long GOP by the coding equipment 133-3 after the end of edit. Thussince the encoding parameter used for the degree which is coding changed when coding and decoding were repeated by picture informationSUBJECT in which picture information deteriorates occurred.

[0006]While making the scale of a device small by making this invention in view of such a situationand performing recoding using the motion vector calculated in the pastit makes it possible to control degradation of the picture accompanying recoding.

[0007]

[Means for Solving the Problem]written this invention is characterized by it having been alike and comprising the following at claim 1.

A hysteresis information decoding means which decodes coding hysteresis information in the past coding processing inserted in user data area of a picture layer of a bit stream.

A video-data decoding means which decodes a video data from a bit stream.

[0008]written this invention is characterized by it having been alike and comprising the following at claim 2.

A hysteresis information decoding step which decodes coding hysteresis information in the past coding processing inserted in user data area of a picture layer of a bit stream.

A video-data decoding step which decodes a video data from a bit stream.

[0009]A hysteresis information decoding step which decodes coding hysteresis information in the past coding processing in which the distribution medium according to claim 3 was inserted in user data area of a picture layer of a bit streamA program which a computer which performs processing containing a video-data decoding step which decodes a video data from a bit stream can read is provided.

[0010]In the decoding device according to claim 1the decoding method according to claim 2and the distribution medium according to claim 3coding hysteresis information inserted in user data

area of a picture layer of a bit stream is decoded.
[0011]
[Embodiment of the Invention]Although an embodiment of the invention is described belowit is as followswhen an embodiment [/ in the parenthesis after each means] (howeveran example) is added and the feature of this invention is describedin order to clarify correspondence relation between each means of an invention given in a claimand following embodiments.
[0012]written this invention is characterized by it having been alike and comprising the following at claim 1.
The hysteresis information decoding means which decodes the coding hysteresis information in the past coding processing inserted in the user data area of the picture layer of a bit stream (for examplehistory decoding device 104 of drawing 15).
The video-data decoding means which decodes a video data from a bit stream (for exampledecoding device 102 of drawing 15).

[0013]Howeverof coursethis statement does not mean limiting to what indicated each means.
[0014]Before explaining the transformer coder which applied this inventionthe compression encoding of a dynamic image signal is explained. The term of a system as used herein means the overall device constituted by two or more devicesa meansetc.
[0015]For examplelike the video conference system and the video telephone systemin the system which transmits a dynamic image signal to a remote placein order to use a transmission line efficientlyit is made as [carry out / compression encoding of the picture signal] using the line correlation and inter frame correlation of a video signal.
[0016]If line correlation is usedDCT (discrete cosine transform) processing can be carried outfor exampleand a picture signal can be compressed.
[0017]If inter frame correlation is usedit will become possible to compress a picture signal further and to code. For exampleas shown in drawing 1when being generated by the frame images PC1 thru/or PC3 in the time t1 thru/or t3respectivelythe difference of the picture signal of the frame images PC1 and PC2 is calculatedPC12 is generatedand the difference of the frame images PC2 and PC3 is calculatedand PC23 is generated. Usuallysince the picture of the frame which adjoins in time does not have a so big changeif both difference is calculatedthe differential signal will become a thing of a small value. Thena code amount is compressible if this differential signal is coded.
[0018]Howeverthe original picture cannot be restored if only the differential signal was transmitted. Thenthe picture of each frame is used as either of three kinds of picture typesI pictureP pictureor B pictureand it is made to carry out compression encoding of the picture signal.
[0019]That isas shownfor example in drawing 2frame F1 thru/or the picture signal of 17 frames to F17 are made into a glue PUOBU picture (GOP)and it may be one unit of processing. And the picture signal of frame F1 of the head is coded as an I pictureand the 2nd frame F2 processes the 3rd frame F3 as a B picture as a P picturerespectively. Hereafterthe frames F4 thru/or F17 of the 4th henceforth are processed by turns as B picture or a P picture.
[0020]As a picture signal of I picturethe picture signal for the one frame is transmitted as it is. On the other handas a picture signal of P picturefundamentallyas shown in drawing 2the difference from the picture signal of I picture or P picture preceded in time than it is

transmitted. Furthermoreas a picture signal of B picturefundamentallyas shown in drawing 3it asks for the difference from the average value of both the frame preceded in time or the frame which carries out backwardand the difference is coded.

[0021]Drawing 4 is carried out in this wayand the principle of the method of coding a dynamic image signal is shown. As shown in the figuresince the first frame F1 is processed as an I pictureit is transmitted to a transmission line as transmission data F1X as it is (formation of a picture inner code). On the other handsince the 2nd frame F2 is processed as a B picturethe difference of frame F1 preceded in time and the average value of the frame F3 which carries out backward in time calculatesand the difference is transmitted as the transmission data F2X.

[0022]Howeverif the processing as this B picture is explained still more finelythey exist. [four kinds of] The 1st processing transmits the data of the original frame F2 as the transmission data F2X as it isand turns into the same processing as the case in I picture (intra coding) (SP1). The 2nd processing calculates the difference from the next frame F3 in timeand transmits the difference (SP2) (backward prediction coding). The 3rd processing transmits difference (SP3) with frame F1 preceded in time (forward prediction coding). Furthermorethe 4th processing generates difference (SP4) with the average value of the frame F3 which carries out backward to frame F1 preceded in timeand transmits this as the transmission data F2X (both-directions prediction coding).

[0023]The way the transmission data of the four methods mentioned above decreases most actually is adopted.

[0024]The motion vector x1 (frame F1 and motion vector between F2) (in the case of forward prediction) between the pictures (estimated image) of the frame which serves as an object which calculates difference when transmitting difference dataOr both x2 (motion vector between the frames F3 and F2) (in the case of backward prediction)or x1 and x2 (in the case of both-directions prediction) are transmitted with difference data.

[0025]A differential signal (SP3) with this frame and the motion vector x3 calculate the frame F3 of P picture by using as an estimated image frame F1 preceded in timeand this is transmitted as the transmission data F3X (forward prediction coding). Or the data of the original frame F3 is transmitted as the data F3X as it is again (intra coding). (SP1) As for whether it is transmitted by which methodthe way transmission data decreases more is chosen like the case in B picture.

[0026]Drawing 5 codes and transmits a dynamic image signal based on the principle mentioned aboveand the example of composition of the device which decrypts this is shown. The coding equipment 1 codes the inputted video signaland is made as [transmit / to the recording medium 3 as a transmission line]. And the decoding device 2 reproduces the signal recorded on the recording medium 3and is made as [output / this / decode and].

[0027]In the coding equipment 1the inputted video signal is inputted into the preprocessing circuit 11a luminance signal and a chrominance signal (in the case of this embodiment color-difference signal) are separated thereand an analog signal is changed into a digital signal with A/D converters 12 and 13respectively. The video signal changed into the digital signal by A/D converters 12 and 13 is supplied to the frame memory 14and is memorized. The frame memory 14 memorizes a luminance signal to the luminance-signal frame memory 15and makes the color-difference-signal frame memory 16 memorize a color-difference signalrespectively.

[0028]The format conversion circuit 17 changes into the signal of a block format the signal of the frame format memorized by the frame memory 14. That isas shown in drawing 6let the

video signal memorized by the frame memory 14 be the data of a frame format as shown in drawing 6 (A) in which the lines of V lines of H dot were collected per line. The format conversion circuit 17 classifies this signal of one frame into M slices by making 16 lines into a unitas shown in drawing 6 (B). And each slice is divided into M macro blocks. As a macro block is shown in drawing 6 (C)it is constituted by the luminance signal corresponding to 16x16 pixels (dot)and this luminance signal is classified into block Y [1] which makes further 8x8 dots a unit thru/or Y [4]. And the Cb signal of 8x8 dots and the Cr signal of 8x8 dots are equivalent to this luminance signal of 16x16 dots.

[0029]Thusthe data changed into the block format is supplied to the encoder 18 from the format conversion circuit 17and encoding (coding) is performed here. The details are later mentioned with reference to drawing 7.

[0030]The signal encoded by the encoder 18 is outputted to a transmission line as a bit stream. For examplethe record circuit 19 is supplied and it is recorded on the recording medium 3 as a digital signal.

[0031]The data reproduced by the regenerative circuit 30 from the recording medium 3 is supplied to the decoder 31 of the decoding device 2and is decoded. The details of the decoder 31 are later mentioned with reference to drawing 12.

[0032]The data decoded by the decoder 31 is inputted into the format conversion circuit 32and is changed into a frame format from a block format. And the luminance signal of a frame format is supplied to the luminance-signal frame memory 34 of the frame memory 33and is memorizedand a color-difference signal is supplied to the color-difference-signal frame memory 35and is memorized. The luminance signal and color-difference signal which were read from the luminance-signal frame memory 34 and the color-difference-signal frame memory 35 are changed into an analog signal by D/A converters 36 and 37respectivelyand are supplied to the post-processing circuit 38. The post-processing circuit 38 compounds and outputs a luminance signal and a color-difference signal.

[0033]Nextthe composition of the encoder 18 is explained with reference to drawing 7. The image data coded is inputted into the motion vector detection circuit 50 by a macro block unit. The motion vector detection circuit 50 processes the image data of each frame as I pictureP pictureor a B picture according to the predetermined sequence set up beforehand. Whether the picture of each frame inputted sequentially is processed as which picture of IPor B. it is set beforehand (for examplethe glue PUOBU picture constituted by frame F1 thru/or F17 as shown in drawing 2 and drawing 3 -- IBPBPand ... processed as B and P).

[0034]The image data of the frame (for exampleframe F1) processed as an I pictureThe image data of the frame (for exampleframe F2) which is transmitted and memorized by the front original image part 51a of the frame memory 51 from the motion vector detection circuit 50and is processed as a B pictureThe original image part 51b transmits and memorizesand the image data of the frame (for exampleframe F3) processed as a P picture is transmitted and memorized by the back original image part 51c.

[0035]When the picture of the frame which should be further processed as B picture (frame F4) or a P picture (frame F5) is inputted in the following timingThe image data of the first P picture (frame F3) memorized by the back original image part 51c till thenIt is transmitted to the front original image part 51athe image data of the following B picture (frame F4) is memorized by the original image part 51b (overwrite)and the image data of the following P picture (frame F5) is

memorized by the back original image part 51c (overwrite). Such operation is repeated successively.
[0036]The signal of each picture memorized by the frame memory 51 is read from thereand frame prediction mode processing or field prediction mode processing is performed in the prediction mode switching circuit 52.
[0037]In the operation part 53the operation of the prediction within a pictureforward predictionbackward predictionor both-directions prediction is performed under control of the prediction decision circuit 54 further again. It is determined corresponding to a prediction error signal (difference of the image comparison made into the object of processingand the estimated image to this) whether to perform processing [which] among these processings. For this reasonthe motion vector detection circuit 50 generates the absolute value sum (the sum of squares may be sufficient) of the prediction error signal used for this judgment.
[0038]Herethe frame prediction mode and field prediction mode in the prediction mode switching circuit 52 are explained.
[0039]When frame prediction mode is set upthe prediction mode switching circuit 52 outputs four luminosity block Y [1] supplied from the motion vector detection circuit 50 thru/or Y [4] to the latter operation part 53 as it is. Namelyit is in the state where the data of the line of an odd number field and the data of the line of an even number field were intermingled in each luminosity blockas [show / in drawing 8] in this case. In this frame prediction modeprediction is performed by making four luminosity blocks (macro block) into a unitand one motion vector corresponds to four luminosity blocks.
[0040]On the other handthe prediction mode switching circuit 52As shown in drawing 9the signal inputted from the motion vector detection circuit 50 in field prediction mode with the composition shown in drawing 8For exampleluminosity block Y [1] and Y [2] are made to constitute only from a dot of the line of an odd number field among four luminosity blocksand other two luminosity block Y [3] and Y [4] are made to constitute only from a dot of the line of an even number fieldand are outputted to the operation part 53. In this caseone motion vector corresponds to two luminosity block Y [1] and Y [2]and other one motion vector corresponds to other two luminosity block Y [3] and Y [4].
[0041]The motion vector detection circuit 50 outputs the absolute value sum of the absolute value sum of the prediction error in frame prediction modeand the prediction error in field prediction mode to the prediction mode switching circuit 52. The prediction mode switching circuit 52 compares the absolute value sum of the prediction error in frame prediction mode and field prediction modeperforms processing corresponding to the prediction mode in which the value is smalland outputs data to the operation part 53.
[0042]Howeversuch processing is performed actually in the motion vector detection circuit 50. That isthe motion vector detection circuit 50 outputs the signal of the composition corresponding to the determined mode to the prediction mode switching circuit 52and the prediction mode switching circuit 52 outputs the signal to the latter operation part 53 as it is.
[0043]In the case of frame prediction modeas shown in drawing 8a color-difference signal is in the state where the data of the line of an odd number field and the data of the line of an even number field are intermingledand is supplied to the operation part 53. In the case of field prediction modeas shown in drawing 9each color difference block Cb and the upper half (four lines) of CrIt is considered as the color-difference signal of the odd number field corresponding

to luminosity block Y [1] and Y [2]and a lower half (four lines) is made into the color-difference signal of the even number field corresponding to luminosity block Y [3] and Y [4].

[0044]As the motion vector detection circuit 50 is shown belowin the prediction decision circuit 54it generates the absolute value sum of the prediction error for determining whether to perform prediction [which / of the prediction within a pictureforward prediction backward predictionor both-directions prediction].

[0045]That isthe difference of total sigma|Aij | of absolute value |sigmaAij| of total sigmaAij of the signal Aij of the macro block of an image comparison and absolute value |Aij| of the signal Aij of a macro block is searched for as an absolute value sum of the prediction error of the prediction within a picture. It asks for total sigma|Aij-Bij [of absolute value |Aij-Bij| of difference Aij-Bij of the signal Aij of the macro block of an image comparisonand the signal Bij of the macro block of an estimated image] | as an absolute value sum of the prediction error of forward prediction. It asks for the absolute value sum of the prediction error of backward prediction and both-directions prediction as well as (changing the estimated image into a different estimated image from the case in forward prediction) the case in forward prediction.

[0046]These absolute value sums are supplied to the prediction decision circuit 54. The prediction decision circuit 54 chooses the smallest thing of the absolute value sums of the prediction error of forward predictionbackward predictionand both-directions prediction as an absolute value sum of the prediction error of the Inta prediction. The absolute value sum of the prediction error of this Inta prediction is compared with the absolute value sum of the prediction error of the prediction within a picturethe smaller one of it is chosenand the mode corresponding to this selected absolute value sum is chosen as prediction mode. That isif the absolute value sum of the prediction error of the prediction within a picture is smallerthe prediction mode within a picture will be set up. If the absolute value sum of the prediction error of the Inta prediction is smallerthe mode whose absolute value sum to which it corresponds of forward predictionbackward predictionor the both-directions prediction modes was the smallest will be set up.

[0047]Thusthe motion vector detection circuit 50 is the composition corresponding to the mode chosen by the prediction mode switching circuit 52 among a frame or field prediction mode in the signal of the macro block of an image comparisonWhile supplying the operation part 53 via the prediction mode switching circuit 52the motion vector between the estimated image corresponding to the prediction mode in which the prediction decision circuit 54 of the four prediction modes was selectedand an image comparison is detectedand it outputs to the variable-length-coding circuit 58 and the motion compensation circuit 64. As mentioned abovethat from which the corresponding absolute value sum of a prediction error serves as the minimum as this motion vector is chosen.

[0048]When the motion vector detection circuit 50 has read the image data of I picture from the front original image part 51a in the prediction decision circuit 54As prediction modea frame or field (picture) inner prediction mode (mode in which a motion compensation is not performed) is set upand the switch 53d of the operation part 53 is changed to the point-of-contact a side. Therebythe image data of I picture is inputted into the DCT mode switching circuit 55.

[0049]As shown in <u>drawing 10</u> or <u>drawing 11</u>the DCT mode switching circuit 55The data of four luminosity blocks is changed into the state (frame DCT mode) where the line of an odd number

field and the line of an even number field are intermingled or the separated state (field DCT mode)and the state of ********and is outputted to DCT circuit 56.
[0050]That isthe DCT mode switching circuit 55 compares the encoding efficiency at the time of being intermingled and carrying out DCT processing of the data of an odd number field and an even number field with the encoding efficiency at the time of carrying out DCT processing in the state where it dissociatedand chooses the mode with good encoding efficiency.
[0051]For examplethe inputted signal is considered as the composition in which the line of an odd number field and an even number field is intermingled as shown in drawing 10the difference of the signal of the line of an odd number field and the signal of the line of an even number field which adjoins up and down is calculatedand it asks for the sum (or sum of squares) of the absolute value further.
[0052]The inputted signal is considered as the composition which the line of an odd number field and an even number field separated as shown in drawing 11the difference of the signal of the lines of the odd number field which adjoins up and downand the difference of the signal of the lines of an even number field are calculatedand it asks for the sum (or sum of squares) of each absolute value.
[0053]Both (absolute value sum) are compared and the DCT mode corresponding to a small value is set up. That isif former one is smallframe DCT mode will be set upand if latter one is smallfield DCT mode will be set up.
[0054]And while outputting the data of the composition corresponding to the selected DCT mode to DCT circuit 56the DCT flag which shows the selected DCT mode is outputted to the variable-length-coding circuit 58 and the motion compensation circuit 64.
[0055]The prediction mode (drawing 8 and drawing 9) in the prediction mode switching circuit 52 is compared with the DCT mode (drawing 10 and drawing 11) in this DCT mode switching circuit 55and the data structure [in / about a luminosity block / each mode of both] is substantially the same so that clearly.
[0056]Also in [when frame prediction mode (mode in which an odd line and an even line are intermingled) is chosen in the prediction mode switching circuit 52] the DCT mode switching circuit 55In [a possibility that frame DCT mode (mode in which an odd line and an even line are intermingled) will be chosen is highand] the prediction mode switching circuit 52When field prediction mode (mode in which the data of an odd number field and an even number field was separated) is chosenin the DCT mode switching circuit 55a possibility that field DCT mode (mode in which the data of an odd number field and an even number field was separated) will be chosen is high.
[0057]Howeverthe mode not necessarily always is not necessarily chosen in this waythe mode is determined that the absolute value sum of a prediction error will become small in the prediction mode switching circuit 52and the mode is determined that encoding efficiency will become good in the DCT mode switching circuit 55.
[0058]It is inputted into DCT circuit 56DCT processing is carried outand the image data of I picture outputted from the DCT mode switching circuit 55 is changed into a DCT coefficient. This DCT coefficient is inputted into the variable-length-coding circuit 58after being inputted into the quantization circuit 57 and quantized with the quantizing scale corresponding to the data accumulation amount (buffer accumulated dose) of the transmission buffer 59.
[0059]Corresponding to the quantizing scale (scale) supplied from the quantization circuit 57the

image data (in the case of now data of I picture) supplied from the quantization circuit 57 is changed into variable length codessuch as Huffman codingfor exampleand the variable-length-coding circuit 58 outputs it to the transmission buffer 59.
[0060]In the variable-length-coding circuit 58from the quantization circuit 57 again A quantizing scale (scale)the prediction decision circuit 54 -- prediction mode (the prediction within a pictureforward predictionand backward prediction.) Any of both-directions prediction were set up from the mode and the motion vector detection circuit 50 which are shown Or a motion vectorFrom the prediction mode switching circuit 52a prediction flag (flag which shows any should be set up between frame prediction mode or field prediction mode)And the DCT flag (flag which shows any should be set up between frame DCT mode or field DCT mode) which the DCT mode switching circuit 55 outputs is inputtedand variable length coding also of these is carried out.
[0061]The transmission buffer 59 stores the inputted data temporarilyand outputs the data corresponding to an accumulated dose to the quantization circuit 57. The transmission buffer 59 will reduce the data volume of quantization data by enlarging the quantizing scale of the quantization circuit 57 with a quantized control signalif the data residue increases to permission upper limit. Contrary to thisif a data residue decreases to a permission lower limitthe transmission buffer 59 will increase the data volume of quantization data by making the quantizing scale of the quantization circuit 57 small with a quantized control signal. Thusoverflow or underflow of the transmission buffer 59 is prevented.
[0062]And the data stored in the transmission buffer 59 is read to predetermined timingand is outputted to a transmission linefor exampleis recorded on the recording medium 3 via the record circuit 19.
[0063]On the other handthe data of I picture outputted from the quantization circuit 57 is inputted into the inverse quantizing circuit 60and inverse quantization is carried out corresponding to the quantizing scale supplied from the quantization circuit 57. The output of the inverse quantizing circuit 60 is inputted into the IDCT (reverse discrete cosine transform) circuit 61and after reverse discrete cosine transform processing is carried outvia the computing unit 62forward prediction picture part 63a supply of the frame memory 63 is carried outand it is memorized.
[0064]The motion vector detection circuit 50 the image data of each frame inputted sequentiallyFor exampleIBPBPB ... When processing as a picturerespectivelyAfter processing the image data of the frame inputted first as an I picturebefore processing the picture of the frame inputted into the next as a B picturethe image data of the frame further inputted into the next is processed as a P picture. It is because it cannot decode unless P picture as a backward prediction image is prepared previouslyin order to accompany B picture by backward prediction.
[0065]Thenthe motion vector detection circuit 50 is processing of I picturenext starts processing of the image data of P picture memorized by the back original image part 51c. And the absolute value sum of the inter-frame difference (prediction error) in a macro block unit is supplied to the prediction mode switching circuit 52 and the prediction decision circuit 54 from the motion vector detection circuit 50 like the case where it mentions above. The prediction mode switching circuit 52 and the prediction decision circuit 54 set up the prediction mode of a frame / field prediction mode or the prediction within a pictureforward predictionbackward predictionor both-directions prediction corresponding to the absolute value sum of the

prediction error of the macro block of this P picture.
[0066]When the prediction mode within a picture is set upthe operation part 53 is changed to the point-of-contact a sideas the switch 53d was mentioned above. Thereforethis data is transmitted to a transmission line like the data of I picture via the DCT mode switching circuit 55DCT circuit 56the quantization circuit 57the variable-length-coding circuit 58and the transmission buffer 59. Via the inverse quantizing circuit 60the IDCT circuit 61and the computing unit 62this data is supplied to the backward prediction picture part 63b of the frame memory 63and is memorized.
[0067]When forward prediction mode is set upwhile the switch 53d is changed to the point of contact bThe picture (in case of now picture of I picture) data memorized by the forward prediction picture part 63a of the frame memory 63 is readand a motion compensation is carried out by the motion compensation circuit 64 corresponding to the motion vector which the motion vector detection circuit 50 outputs. Namelywhen it is ordered the motion compensation circuit 64 in setting out in forward prediction mode from the prediction decision circuit 54Only the part corresponding to the position lost-motion vector corresponding to the position of the macro block to which the motion vector detection circuit 50 is outputting the reading address of the forward prediction picture part 63a now is shifteddata is readand prediction image data is generated.
[0068]The prediction image data outputted from the motion compensation circuit 64 is supplied to the computing unit 53a. The computing unit 53a subtracts the prediction image data corresponding to this macro block supplied from the motion compensation circuit 65 from the data of the macro block of the image comparison supplied from the prediction mode switching circuit 52and outputs that difference (prediction error). This difference data is transmitted to a transmission line via the DCT mode switching circuit 55DCT circuit 56the quantization circuit 57the variable-length-coding circuit 58and the transmission buffer 59. This difference data is locally decoded by the inverse quantizing circuit 60 and the IDCT circuit 61and is inputted into the computing unit 62.
[0069]The same data as the prediction image data currently supplied to the computing unit 53a is supplied to this computing unit 62 again. The computing unit 62 adds the prediction image data which the motion compensation circuit 64 outputs to the difference data which the IDCT circuit 61 outputs. Therebythe image data of the original P (it decoded) picture is obtained. The image data of this P picture is supplied to the backward prediction picture part 63b of the frame memory 63and is memorized.
[0070]In this waythe motion vector detection circuit 50 performs processing of B picture nextafter the data of I picture and P picture is memorized by the forward prediction picture part 63a and the backward prediction picture part 63brespectively. The prediction mode switching circuit 52 and the prediction decision circuit 54Corresponding to the size of the absolute value sum of the inter-frame difference in a macro block unita frame/field mode is set up and prediction mode is set to either the prediction mode within a pictureforward prediction modebackward prediction mode or both-directions prediction mode.
[0071]As mentioned abovethe switch 53d is changed to the point of contact a or b at the time of the prediction mode within a pictureor forward prediction mode. At this timethe same processing as the case in P picture is performedand data is transmitted.
[0072]On the other handwhen backward prediction mode or both-directions prediction mode is

set upthe switch 53d is changed to the point of contact c or drespectively.
[0073]It is read by the picture (in case of now picture of P picture) data memorized by the backward prediction picture part 63b at the time of the backward prediction mode in which the switch 53d is changed to the point of contact cand by the motion compensation circuit 64. A motion compensation is carried out corresponding to the motion vector which the motion vector detection circuit 50 outputs. Namelywhen it is ordered the motion compensation circuit 64 in setting out in backward prediction mode from the prediction decision circuit 54Only the part corresponding to the position lost-motion vector corresponding to the position of the macro block to which the motion vector detection circuit 50 is outputting the reading address of the backward prediction picture part 63b now is shifteddata is readand prediction image data is generated.
[0074]The prediction image data outputted from the motion compensation circuit 64 is supplied to the computing unit 53b. The computing unit 53b subtracts the prediction image data supplied from the motion compensation circuit 64 from the data of the macro block of the image comparison supplied from the prediction mode switching circuit 52and outputs the difference. This difference data is transmitted to a transmission line via the DCT mode switching circuit 55DCT circuit 56the quantization circuit 57the variable-length-coding circuit 58and the transmission buffer 59.
[0075]The picture (in case of now picture of I picture) data memorized by the forward prediction picture part 63a at the time of the both-directions prediction mode in which the switch 53d is changed to the point of contact dThe picture (in case of now picture of P picture) data memorized by the backward prediction picture part 63b is readand a motion compensation is carried out by the motion compensation circuit 64 corresponding to the motion vector which the motion vector detection circuit 50 outputs.
[0076]Namelywhen it is ordered the motion compensation circuit 64 in setting out in both-directions prediction mode from the prediction decision circuit 54The reading address of the forward prediction picture part 63a and the backward prediction picture part 63bThe motion vector detection circuit 50 shifts only the part corresponding to the position lost-motion vector (the motion vector in this case is set to twothe object for forward prediction picturesand the object for backward prediction pictures) corresponding to the position of the macro block outputted nowreads dataand generates prediction image data.
[0077]The prediction image data outputted from the motion compensation circuit 64 is supplied to the computing unit 53c. The computing unit 53c subtracts the average value of the prediction image data supplied from the motion compensation circuit 64 from the data of the macro block of the image comparison supplied from the motion vector detection circuit 50and outputs the difference. This difference data is transmitted to a transmission line via the DCT mode switching circuit 55DCT circuit 56the quantization circuit 57the variable-length-coding circuit 58and the transmission buffer 59.
[0078]Since the picture of B picture is not used as the estimated image of other picturesit is not memorized by the frame memory 63.
[0079]In the frame memory 63bank switching is performed if neededand to a predetermined image comparisonthe forward prediction picture part 63a and the backward prediction picture part 63b can change what is memorized on one side or another side as a forward prediction picture or a backward prediction pictureand can output it.

[0080]In the explanation mentioned abovealthough explained focusing on the luminosity blockabout a color difference blocksimilarlyit is processed as a unit and the macro block shown in drawing 8 thru/or drawing 11 is transmitted. What set to one half the motion vector of the luminosity block with which the motion vector in the case of processing a color difference block corresponds to the perpendicular direction and the horizontal directionrespectively is used.
[0081]Drawing 12 is a block diagram showing the composition of the decoder 31 of drawing 5. After being received in the receiving circuit which is not illustratedor being reproduced with playback equipment and storing temporarily the coded image data which was transmitted via the transmission line (recording medium 3) at the receive buffer 81it is supplied to the variable length decoding circuit 82 of the decoder circuit 90. The variable length decoding circuit 82 carries out variable-length decryption of the data supplied from the receive buffer 81While outputting a motion vectorprediction modea prediction flagand a DCT flag to the motion compensation circuit 87 and outputting a quantizing scale to the inverse quantizing circuit 83the decoded image data is outputted to the inverse quantizing circuit 83.
[0082]The inverse quantizing circuit 83 carries out inverse quantization of the image data supplied from the variable length decoding circuit 82 according to the quantizing scale similarly supplied from the variable length decoding circuit 82and outputs it to the IDCT circuit 84. Reverse discrete cosine transform processing is performed by the IDCT circuit 84and the data (DCT coefficient) outputted from the inverse quantizing circuit 83 is supplied to the computing unit 85.
[0083]When the image data supplied to the computing unit 85 from the IDCT circuit 84 is data of I pictureThe data is outputted from the computing unit 85for prediction-image-data generation of the image data (data of P or B picture) behind inputted into the computing unit 85is supplied to the forward prediction picture part 86a of the frame memory 86and is memorized. This data is outputted to the format conversion circuit 32 (drawing 5).
[0084]The image data supplied from the IDCT circuit 84 is data of P picture which uses the image data in front of one of them as prediction image dataWhen it is data in forward prediction modethe image data (data of I picture) before [one] the forward prediction picture part 86a of the frame memory 86 memorizes is readand the motion compensation corresponding to the motion vector outputted from the variable length decoding circuit 82 in the motion compensation circuit 87 is given. And in the computing unit 85it is added with the image data (data of difference) supplied from the IDCT circuit 84and is outputted. For prediction-image-data generation of the image data (data of B picture or P picture) behind inputted into the computing unit 85this added datai.e.the decoded data of P pictureis supplied to the backward prediction image part 86b of the frame memory 86and it is memorized.
[0085]Even if it is data of P pictureas for the data in the prediction mode within a picturelike the data of I pictureprocessing is not performed in the computing unit 85but the backward prediction picture part 86b memorizes as it is.
[0086]Since this P picture is a picture which should be displayed on the next of the following B pictureit is not outputted to the format conversion circuit 32 yet at this time (as mentioned aboveP picture inputted after B picture is processed ahead of B pictureand is transmitted).
[0087]When the image data supplied from the IDCT circuit 84 is data of B pictureit corresponds to the prediction mode supplied from the variable length decoding circuit 82The image data of I picture memorized by the forward prediction picture part 86a of the frame memory 86 (in the

case of forward prediction mode)The image data of P picture memorized by the backward prediction picture part 86b (in the case of backward prediction mode)Or the image data (in the case of both-directions prediction mode) of the both is readthe motion compensation corresponding to the motion vector outputted from the variable length decoding circuit 82 is given in the motion compensation circuit 87and an estimated image is generated. Howeveran estimated image is not generated when you do not need a motion compensation (in the case of the prediction mode within a picture).
[0088]Thusthe data in which the motion compensation was given is added with the output of the IDCT circuit 84 in the computing unit 85 in the motion compensation circuit 87. This added output is outputted to the format conversion circuit 32.
[0089]Howeverthis added output is data of B pictureand since it is not used for estimated image generation of other picturesit is not memorized by the frame memory 86.
[0090]After the picture of B picture is outputtedthe image data of P picture memorized by the backward prediction picture part 86b is readand the computing unit 85 is supplied via the motion compensation circuit 87. Howevera motion compensation is not performed at this time.
[0091]Although the circuit corresponding to the prediction mode switching circuit 52 and the DCT mode switching circuit 55 in the encoder 18 of drawing 5 is not illustrated by this decoder 31The processing corresponding to these circuitsi.e.the processing which returns the composition from which the signal of the line of an odd number field and an even number field was separated to the original composition if neededis performed by the motion compensation circuit 87.
[0092]In the explanation mentioned abovealthough processing of the luminance signal was explainedprocessing of a color-difference signal is performed similarly. Howeveras for the motion vector in this casea perpendicular direction and the thing horizontally set to one half are used in the motion vector for luminance signals.
[0093]Drawing 13 shows the quality of the coded picture. The quality (SNR:Signal toNoise Ratio) of a picture is controlled corresponding to a picture typeI picture and P picture are made qualityand B picture is made into the quality which is inferior compared with I and P pictureand is transmitted. This is a technique using human being's vision characteristicsand the way which vibrated quality is because the image quality on vision becomes good rather than equalizing all the imaging quality. Control of the image quality corresponding to this picture type is performed by the quantization circuit 57 of drawing 7.
[0094]Drawing 14 shows the composition of the transformer coder 101 which applied this inventionand drawing 15 shows the still more detailed composition. The decoding device 102 the coded picture signal which is included in the bit stream of the predetermined bit rate (in the case of this example 10Mbps) (it has multiplexed)the present encoding parameter (a frame / field DCT flag.) of the bit stream contained in a bit stream (it has multiplexed) While decoding using a frame / field prediction flagprediction modea picture typea motion vectormacro block informationand a quantizing scale and outputting to the encoding parameter multiplexer 103It is made as [output / to the encoding parameter multiplexer 103 / the present encoding parameter].
[0095]The user datum contained in a bit stream is decodedit dissociates againand the decoding device 102 is outputted to the history decoding device 104. Although those details are mentioned laterthe generation hysteresis information which comprises an encoding parameter

for three latest generations is included in this user datum. The present encoding parameterfor example On the other handgroup_of_pictures_header (1)extension_and_user_data (1)picture_header()It is contained in picture_coding_extension()extensions_data (2)picture_data()or sequence_extension() (drawing 38 mentioned later). The history decoding device 104 decodes the inputted user datumand outputs the generation hysteresis information containing the encoding parameter for three generations to the encoding parameter multiplexer 103.

[0096]The decoding device 102 is changed into the decoder 111 which shows drawing 16 the decoder 31 (drawing 12) of the decoding device 2 of drawing 5. The variable length decoding circuit 112 of the decoder 111 extracts an user datum including generation hysteresis informationand is made as [output / to the history decoding device 104] while extracting the present encoding parameter from a bit stream and supplying a predetermined circuit. Since the composition of others of the decoder 111 is the same as that of the decoder 31the explanation is omitted.

[0097]Free space of image data where the encoding parameter multiplexer 103 was decoded (the details) The encoding parameter for four generations is written in for explaining with reference to drawing 18 (multiplexing)and it outputs to the encoding parameter (dedicated bus for encoding parameter transmissionetc. are not provided) decollator 105 by which rough union was carried out as a digital video signal of baseband. The encoding parameter decollator 105 is made as [supply / separate image data and the encoding parameter used for coding with the coding equipment 106 from the digital video signal of basebandand / the coding equipment 106].

[0098]The encoding parameter decollator 105 extracts again the encoding parameter for three generations except the encoding parameter used with the coding equipment 106 from the inputted digital video signal of basebandand outputs it to the history coding equipment 107. The history coding equipment 107 writes the encoding parameter for three inputted generations in an user datumand outputs the user datum to the coding equipment 106.

[0099]The format of the image data in which code parameters are written is explained with reference to drawing 17 and drawing 18. One macro block comprises 16x16 pixelsas shown in drawing 17. This 16x16-pixel data comprises luminance-signal Y[0] [x] thru/or Y[4] [x]8x8-pixel color-difference-signal Cr [0] [x]Cr[1] [x] and Cb[0] [x]and Cb[1] [x] (x= 2 thru/or 9) 8x8-pixel. For exampleluminance-signal Y [0] and [9] show the luminance signal of the 8x8-pixel pixel (8 pixels) of the 1st line. Since the amount of information of the luminance signal per pixel is 8 bitsthe amount of information of luminance-signal Y [0] and [9] will be 8(pixel)x8(bit)=64 bit. The same may be said of a color-difference signal.

[0100]On the other handsince the field for ten lines (D0 thru/or D9) is provided as shown in drawing 18the format of image data becomes unnecessary [the field for two lines (D0D1)]. Since information (64 bits x 16= 1024 bits) is recordable on this free spaceencoding parameters other than original image data are written in the field for these two lines. Since the encoding parameter corresponding to one macro block has the amount of information of 256 bitsit can record the encoding parameter used for the past four coding on this field.

[0101]The field for ten lines (D0 thru/or D9) is established in the image data (digital video signal) transmitted to the encoding parameter decollator 105 from the encoding parameter multiplexer 103 as a field which indicates the luminance signal Ythe color-difference signal

Crand Cb. Howeverthe field where the luminance signal Y etc. are actually written in is a field for eight lines of D2 thru/or D9and the field of D0 and D1 is not used. Thenthis 2-bit field is used as a field for writing of an encoding parameter. By thisan encoding parameter will be written in 2 bits of low ranks of the pixel of the 16x16-pixel position of drawing 17.
[0102]While the coding equipment 106 codes image data using the present encoding parameter supplied as an encoding parameter for the coding to be performed from now onThe user datum supplied from the history coding equipment 107 is multiplexed to a bit streamIt is made as [output / to SDTI(Serial Data Transfer Interface)108-i (i= 12...N) (drawing 30 mentioned later) / by the predetermined bit rate (in the case of this example 5Mbps)].
[0103]The coding equipment 106 is changed into the encoder 121 which shows drawing 19 the encoder 18 (drawing 7) of the coding equipment 1 of drawing 5. The encoder 121 deletes the motion vector detection circuit 50 which generates an encoding parameterthe frame memory 51the prediction mode switching circuit 52the prediction decision circuit 54and the DCT mode switching circuit 55 from the encoder 18It is made to carry out variable length coding of the user datum which the history coding equipment 107 outputs in the variable-length-coding circuit 58. Since the composition of others of the encoder 121 is the same as that of the encoder 18the explanation is omitted.
[0104]Nextthe history decoding device 104 and the history coding equipment 107 in drawing 15 are explained further. As shown in the figurethe history decoding device 104Outputs of the converter 202 which changes the output of the user-datum decoder 201 which decodes the user datum supplied from the decoding device 102and the user-datum decoder 201and the converter 202 are consisted of by the history decoder 203 which reproduces hysteresis information.
[0105]The history coding equipment 107The output of the converter 212 and the converter 212 which change the output of the history formatter 211 which formats the encoding parameter for three generations supplied from the encoding parameter decollator 105and the history formatter 211. It is constituted by the user-datum formatter 213 formatted into the format of an user datum.
[0106]The user-datum decoder 201 decodes the user datum supplied from the decoding device 102and outputs it to the converter 202. Although mentioned later for detailsthe user datum (user_data()) consisted of user_data_start_code and user_dataand has forbidden generating "0" which continues into user_data in an MPEG standard. [23-bit] This is for not carrying out erroneous detection of start_code. Since such continuous "0" may exist in hysteresis informationit is necessary to process this and to change into converted_history_stream() (drawing 38 mentioned later). [of 23 bits or more] The converter 212 of the history coding equipment 107 performs this conversion. The converter 202 of the history decoding device 104 performs a conversion process contrary to this converter 212.
[0107]The history decoder 203 generates hysteresis information from the output of the converter 202and outputs it to the encoding parameter multiplexer 103.
[0108]On the other handin the history coding equipment 107the history formatter 211 changes into the format of hysteresis information the encoding parameter for three generations supplied from the encoding parameter decollator 105. There are a fixed-length thing (drawing 40 thru/or drawing 46 mentioned later) and a variable-length thing (drawing 47 mentioned later) in this format. These details are mentioned later.

[0109]The hysteresis information by which formatting was carried out is changed into converted_history_stream() in the converter 212 by the history formatter 211. This is for not carrying out erroneous detection of start_code of user_data()as mentioned above. That isalthough continuous "0" exists in hysteresis informationsince "0" which continues into user_data cannot be arrangeddata is changed by the converter 212 so that this prohibition item cannot be touched. [of 23 bits or more] [of 23 bits or more]
[0110]The user-datum formatter 213 to converted_history_stream() supplied from the converter 212. Based on drawing 38 mentioned laterData_ID is addedfurtheruser_data_stream_code is addeduser_data which can be inserted into video stream is generatedand it outputs to the coding equipment 106.
[0111]Drawing 20 expresses the example of composition of the history formatter 211. In the symbolic-language converter 301 and code length converter 305. An encoding parameter (encoding parameter transmitted as hysteresis information this time) (item data)The information (for examplename of syntax) (for examplename of sequence_header mentioned later) (item NO.) which specifies the stream which arranges this encoding parameter is supplied from the encoding parameter decollator 105. The inputted encoding parameter is changed into the symbolic language corresponding to the syntax to which it was directedand the symbolic-language converter 301 outputs it to the barrel shifter 302. The barrel shifter 302 shifts only the part corresponding to the shift amount supplied from the address generation circuit 306and outputs the symbolic language inputted from the symbolic-language converter 301 to the switch 303 as a symbolic language of a byte unit. The switch 303 switched by the bit select signal which the address generation circuit 306 outputs is formed by the bitsupplies the symbolic language supplied from the barrel shifter 302 to RAM304and makes it memorize. The writing address at this time is specified from the address generation circuit 306. When a reading address is specified from the address generation circuit 306while the data (symbolic language) memorized by RAM304 is read and the latter converter 212 is suppliedif neededvia the switch 303RAM304 is supplied again and it memorizes.
[0112]The code length converter 305 determines the code length of syntax and an encoding parameter to the encoding parameter which are inputtedand outputs him to the address generation circuit 306. The address generation circuit 306 generates the shift amountthe bit select signalwriting addressor reading address mentioned above corresponding to the inputted code lengthand supplies them to barrel shifter 302switch 303or RAM304respectively.
[0113]As mentioned abovethe history formatter 211 is constituted as what is called a variable-length-coding machinecarries out variable length coding of the inputted encoding parameterand outputs it.
[0114]Drawing 21 expresses the example of composition of the history decoder 203 which decodes the data by which history formatting was carried out as mentioned above. The data of the encoding parameter supplied from the converter 202 is supplied to RAM311and is memorized by this history decoder 203. The writing address at this time is supplied from the address generation circuit 315. The address generation circuit 315 generates a reading address to predetermined timingand supplies it to RAM311 again. At this timeRAM311 reads the data memorized in the reading addressand outputs it to the barrel shifter 312. Only the part corresponding to the shift amount which the address generation circuit 315 outputs shifts the data inputtedand outputs the barrel shifter 312 to the inverse code length converter 313 and

the inverse code word converter 314.
[0115]The name of the syntax of a stream with which the encoding parameter is arranged is supplied to the inverse code length converter 313 from the converter 202 again. Based on the syntaxthe inverse code length converter 313 asks for code length from the inputted data (symbolic language)and outputs the code length who asked to the address generation circuit 315.
[0116]The inverse code word converter 314 decodes the data supplied from the barrel shifter 312 based on syntax (forming an inverse code word)and outputs it to the encoding parameter multiplexer 103.
[0117]The inverse code word converter 314 extracts information (information required to determine a pause of a symbolic language) required to specify what kind of symbolic language is containedand outputs it to the address generation circuit 315. The address generation circuit 315 generates a shift amountand outputs it to the barrel shifter 312 while it generates a writing address and a reading address and outputs them to RAM311 based on the code length inputted from this information and the inverse code length converter 313.
[0118]Drawing 22 expresses the example of composition of the converter 212. The buffer memory 320 arranged between the history formatter 211 and the converter 212 in this example8-bit data is read from the reading address which the controller 326 outputsand D type flip-flop (D-FF) 321 is suppliedand it is made as [hold]. And 8-bit D type flip-flop 322 is also suppliedand the data read from D type flip-flop 321 is held while the staff circuit 323 is supplied. The 8-bit data read from D type flip-flop 322 is compounded with the 8-bit data read from D type flip-flop 321and is supplied to the staff circuit 323 as 16-bit parallel data.
[0119]The staff circuit 323 inserts numerals"1" in the position of the signal (stuff position) which shows the staff position supplied from the controller 326 (carrying out stuffing)and outputs it to the barrel shifter 324 as a total of 17-bit data.
[0120]The barrel shifter 324 shifts the data inputted based on the signal (shift) which shows the shift amount supplied from the controller 326extracts 8-bit dataand outputs it to 8-bit D type flip-flop 325. The data held at D type flip-flop 325 is read from thereand is supplied to the latter user-datum formatter 213 via the buffer memory 327. At this timethe controller 326 generates a writing address with the data to outputand supplies it to the buffer memory 327 which intervenes between the converter 212 and the user-datum formatter 213.
[0121]Drawing 23 expresses the example of composition of the staff circuit 323. The 16-bit data inputted from D type flip-flop 322321 is inputted into the switch 331-16 thru/or the point of contact a of 331-1respectively. The data of the switch which adjoins the MSB side (method of figure Nakagami) is supplied to the point of contact c of switch 331-i (i= 0 thru/or 15). For exampleat the point of contact c of the switch 331-12. The 13th data is supplied from LSB currently supplied to the point of contact a of the switch 331-13 which adjoins the MSB sideand the 14th data is supplied to the point of contact c of the switch 331-13 from the LSB side currently supplied to the point of contact a of the switch 331-13 which adjoins the MSB side.
[0122]Howeverthe point of contact a of the lower switch 331-0 is wide opened further from the switch 331-1 corresponding to LSB. Since the switch of a higher rank does not exist from itthe point of contact c of the switch 331-16 corresponding to MSB is opened wide.
[0123]Data"1" is supplied to each switch 331-0 thru/or the point of contact b of 331-16.
[0124]The decoder 332 corresponds to the signal stuff position which shows the position which

inserts data"1" supplied from the controller 326One switch is changed to the point-of-contact b side the switch 331-0 thru/or among 331-16the switch by the side of LSB is changed to the point-of-contact c side from itrespectivelyand the switch by the side of MSB is made to be changed to the point-of-contact a side from it.

[0125]Drawing 23 shows the example in the case of inserting data"1" in the 13th from the LSB side. Thereforethe switch 331-0 thru/or the switch 331-12 are changed to the point-of-contact c side by each in this casethe switch 331-13 is changed to the point-of-contact b sideand the switch 331-14 thru/or the switch 331-16 are changed to the point-of-contact a side.

[0126]By the above compositionthe converter 212 of drawing 22 will change 22-bit numerals into 23 bitsand will output them.

[0127]Drawing 24 expresses the timing of the output data of each part of the converter 212 of drawing 22. If the controller 326 of the converter 212 generates a reading address (drawing 24 (A)) synchronizing with the clock of a byte unitfrom the buffer memory 320the data corresponding to it will be read per byteand will once be held at D type flip-flop 321. And D type flip-flop 322 is supplied and the data (drawing 24 (B)) read from D type flip-flop 321 is held while the staff circuit 323 is supplied. The data held at D type flip-flop 322 is further read from there (drawing 24 (C))and is supplied to the staff circuit 323.

[0128]Thereforethe input (drawing 24 (D)) of the staff circuit 323In [in the timing of the reading address A1it is considered as 1 byte of first data D0and] the timing of the next reading address A2It becomes 1 byte of data D0and 2 bytes of data which comprises 1 byte of the data D1and becomes the data D1 and 2 bytes of data which comprises the data D2 in the timing of reading address A3 further.

[0129]The signal stuff position (drawing 24 (E)) which shows the position which inserts data"1" is supplied to the staff circuit 323 from the controller 326. The decoder 332 of the staff circuit 323 The switch 331-16 thru/or the inside of 331-0The switch corresponding to this signal stuff position is switched to the point of contact bthe switch by the side of LSB is switched to the point-of-contact c side from itand the switch by the side of MSB is further switched to the point-of-contact a side from it. Therebysince data"1" is insertedfrom the staff circuit 323the data (drawing 24 (F)) in which data"1" was inserted in the position shown by the signal stuff position is outputted.

[0130]The barrel shift only of the quantity shown by the signal shift (drawing 24 (G)) to which the inputted data is supplied from the controller 326 is carried outand it outputs the barrel shifter 324 (drawing 24 (H)). Once this output is further held by D type flip-flop 325it is outputted to the latter part (drawing 24 (I)).

[0131]It is 22-bit datanext data"1" is inserted in the data outputted from D type flip-flop 325. Thereforebetween data "data of 1" and the next" 1"even if all bits in the meantime are 0the number with which the data of 0 continues is set to 22.

[0132]Drawing 25 expresses the example of composition of the converter 202. Although the composition which consists of D type flip-flop 341 thru/or the controller 346 of this converter 202 is the same composition as fundamentally as D type flip-flop 321 of the converter 212 thru/or the controller 326 shown in drawing 22It replaces with the staff circuit 323 in the converter 212and differs from the kick case to the converter 212 in that the DIRITO circuit 343 is inserted. Other composition is the same as that of the case in the converter 212 of drawing 22.

[0133]That isin this converter 202that bit (data "1" inserted in the staff circuit 323 of drawing 22) is deleted for the DIRITO circuit 343 according to the signal delete position which shows the position which is a bit which the controller 346 outputsand to delete.
[0134]Other operations are the same as that of the case in the converter 212 of drawing 22.
[0135]Drawing 26 expresses the example of composition of the DIRITO circuit 343. In this example of composition15 bits by the side of LSB of the 16-bit data inputted from D type flip-flop 342341 are supplied to the switch 351-0 correspondingrespectively thru/or the point of contact a of 351-14. 1 bit of data by the side of MSB is supplied to the point of contact b of each switch. The decoder 352 deletes the bit specified by the signal delete position supplied from the controller 346and is made as [output / as 15-bit data].
[0136]Drawing 26 shows the stateDIRITO [LSB / the 13th bit]. Thereforethe switch 351-0 thru/or the switch 351-11 are changed to the point-of-contact a side in this caseand 12 bits from LSB to the 12th are chosen and outputted as they are. Since it changes to the point-of-contact b siderespectivelythe 14th thru/or the 16th data are chosen as data of the 13th thru/or the 15th bitand the switch 351-12 thru/or 351-14 are outputted.
[0137]That the input of the staff circuit 323 of drawing 23 and the DIRITO circuit 343 of drawing 26 is 16 bitsAlso in [the input of the staff circuit 323 of the converter 212 of drawing 22 is 16 bits supplied from D type flip-flop 322321respectivelyand] the converter 202 of drawing 25The input of the DIRITO circuit 343 is because it is considered as 16 bits by D type flip-flop 342341. By carrying out the barrel shift of the 17 bits which the staff circuit 323 outputs by the barrel shifter 324 in drawing 22For examplethe same with choosing and outputting 8 bits eventuallyalso in the converter 202 of drawing 25the 15-bit data which the DIRITO circuit 343 outputs is used as 8-bit datawhen only the specified quantity carries out a barrel shift by the barrel shifter 344.
[0138]Drawing 27 expresses other examples of composition of the converter 212. In this example of compositionthe counter 361 counts the number which is a bit of 0 which continues among input dataand is made as [output / to the controller 326 / that counted result]. The controller 326 outputs the signal stuff position to the staff circuit 323when 22 bits of 0 which the counter 361 followsfor example are counted. The controller 326 resets the counter 361 and makes the counter 361 count the number of the bits of 0 which continues again at this time.
[0139]Other composition and operations are the same as that of the case in drawing 22.
[0140]Drawing 28 expresses other examples of composition of the converter 202. In this example of compositionthe counter 371 counts the number of 0 which continues among input dataand it is made as [output / to the controller 346 / that counted result]. When the counted value of the counter 371 amounts to 22it resets the counter 371 and makes the counter 371 count the number of the again new bits of continuous 0while the controller 346 outputs the signal delete position to the DIRITO circuit 343. Other composition is the same as that of the case in drawing 25.
[0141]Thusin this example of compositiondata"1" as a marker bit will be inserted and deleted based on a predetermined pattern (number with which data"0" continues).
[0142]The processing more efficient than the composition shown in drawing 22 and drawing 25 of the composition shown in drawing 27 and drawing 28 is attained. Howeverthe length after conversion will be dependent on the original hysteresis information.
[0143]Drawing 29 expresses the example of composition of the user-datum formatter 213. If

the controller 383 outputs a reading address to the buffer memory (not shown) arranged between the converter 212 and the user-datum formatter 213 in this exampleThe data read from there is supplied to the point-of-contact a side of the switch 382 of the user-datum formatter 213. Data required to generate user_data()such as an user-datum start code and data IDis memorized by ROM381. In predetermined timingthe controller 313 changes the switch 382 to the point-of-contact a or point-of-contact b sidechooses suitably the data memorized by ROM381 or the data supplied from the converter 212and outputs it. Therebythe data of a format of user_data() is outputted to the coding equipment 106.

[0144]Although a graphic display is omittedthe user-datum decoder 201 is realizable by making it output input data via the switch which is read and deletes the inserted data from ROM381 of drawing 29.

[0145]Drawing 30 shows the state where two or more transformer coders 101-1 thru/or 101-N are used being connected in seriesfor example in image edit studio. Encoding parameter multiplexer 103-[of each transformer coder 101-i (i= 1 thru/or N)] i overwrites the newest encoding parameter that self used for the division where the oldest encoding parameter of the field for encoding parameters mentioned above is recorded. The encoding parameter for four latest generations corresponding to the same macro block (generation hysteresis information) will be recorded on the image data of baseband by this.

[0146]Encoder 121-[of each coding equipment 106-i] i (drawing 19) codes the video data supplied from the quantization circuit 57 in the variable-length-coding circuit 58 based on the encoding parameter used this time supplied from encoding parameter decollator 105-i. Thusthe present encoding parameter multiplexes in the bit stream (for examplepicture_header()) generated.

[0147]The variable-length-coding circuit 58 multiplexes again the user datum (generation hysteresis information is included) supplied from history coding equipment 107-i in the bit stream to output (it multiplexes not in embedding processing as shown in drawing 18 but in a bit stream). And the bit stream which coding equipment 106-i outputs is inputted into latter transformer coder 101- (i+1) via SDTI108-i.

[0148]Transformer coder 101-i and transformer coder 101- (i+1) are constituted as shown in drawing 15respectively. Thereforethe processing becomes being the same as that of the case where it explains with reference to drawing 15.

[0149]As coding using the history of the actual encoding parameternow what was coded as an I pictureWhen the history of the past encoding parameter is seenthe case where they are P or B picture is looked for in the past to change into P or B picture and these histories exista picture type is changed using parameterssuch as the motion vector. When there is no history in the past on the contrarychange of the picture type which does not perform motion detection is given up. Even if it is a case where there is no historyof coursea picture type can be changed if motion detection is performed.

[0150]In the format shown in drawing 18the encoding parameter for four generations was embeddedbut the parameter of each picture type of IPand B can be embedded. Drawing 31 shows the example of the format in this case. In this examplethe encoding parameter for one generation (picture hysteresis information) is recorded for every picture type when the same macro block is coded with change of a picture type in the past. Thereforethe decoder 111 shown in drawing 16 and the encoder 121 shown in drawing 19Now (newest)the encoding

parameter for one generation corresponding to I pictureP pictureand B picture will be outputted and inputted instead of the encoding parameter of one generationtwo generationsand three generations ago.
[0151]Since the field of Cb[1] [x] and Cr[1] [x] is not used in the case of this examplethis invention is applicable also to the image data of 4:2:0 formats which does not have a field of Cb[1] [x] and Cr[1] [x].
[0152]In the case of this examplethe decoding device 102 takes out an encoding parameter simultaneously with decodingjudges a picture typewrites an encoding parameter in the place corresponding to the picture type of the picture signaland outputs it to the encoding parameter (multiplexing) decollator 105. The encoding parameter decollator 105 separates an encoding parameterand it can perform recoding in consideration of the past encoding parameter inputted as the picture type to code from now onchanging a picture type.
[0153]Nextin each transformer coder 101the processing which judges the picture type which can be changed is explained with reference to the flow chart of drawing 32. Since the past motion vector is usedthis processing is premised on performing without performing motion detection for change of the picture type in the transformer coder 101. Processing explained below is performed by the encoding parameter decollator 105.
[0154]In Step S1the encoding parameter for one generation (picture hysteresis information) is inputted into the encoding parameter controller 122 for every picture type.
[0155]In Step S2the encoding parameter decollator 105 judges whether an encoding parameter when it changes into picture hysteresis information at B picture exists. When judged with an encoding parameter when it changes into B picture existing in picture hysteresis informationit progresses to Step S3.
[0156]In Step S3the encoding parameter decollator 105 judges whether an encoding parameter when it changes into picture hysteresis information at P picture exists. When judged with an encoding parameter when it changes into P picture existing in picture hysteresis informationit progresses to step S4.
[0157]In step S4the encoding parameter decollator 105 judges that the picture types which can be changed are I pictureP pictureand B picture.
[0158]In Step S3when judged with an encoding parameter when it changes into picture hysteresis information at P picture not existingit progresses to Step S5.
[0159]In Step S5the encoding parameter decollator 105 judges that the picture types which can be changed are I picture and B picture. The encoding parameter decollator 105 is judged [that it can change into P picture in falseand] by performing a special process (the backward prediction vector included in the hysteresis information of B picture is not usedbut only a forward prediction vector is used).
[0160]In Step S2when judged with an encoding parameter when it changes into picture hysteresis information at B picture not existingit progresses to Step S6.
[0161]In Step S6the encoding parameter decollator 105 judges whether an encoding parameter when it changes into picture hysteresis information at P picture exists. When judged with an encoding parameter when it changes into P picture existing in picture hysteresis informationit progresses to Step S7.
[0162]In Step S7the encoding parameter decollator 105 judges that the picture types which can be changed are I picture and P picture. The encoding parameter decollator 105 is judged [that

it can change into B pictureand] by performing a special process (only the forward prediction vector included in hysteresis information at P picture is used).
[0163]In Step S6when judged with an encoding parameter when it changes into picture hysteresis information at P picture not existingit progresses to Step S8. In Step S8since a motion vector does not existthe encoding parameter decollator 105 judges that the picture type which can be changed is only I picture (it cannot change other than I picture since it is I picture).
[0164]After processingin step S9the encoding parameter decollator 105 displays the picture type of step S4S5S7and S8 which can be changed on a display (not shown)and notifies a user of it.
[0165]Drawing 33 shows the example of picture type change. The frame number from which change of a picture type constitutes GOP is changed. In the case of this examplenamelyN= 15 (frame number N= 15 of GOP)From Long GOP (the 1st generation) which comprises a frame of M= 3 (I in GOPor appearance cycle M= 3 of P picture). It is changed into Short GOP (second generation) which comprises a frame of N= 1 and M= 1and is again changed into N= 15 and Long GOP (third generation) which comprises a frame of M= 3. The dashed line shows the boundary of GOP in the figure.
[0166]All the frames can change a picture type into I picture so that clearly from explanation of the picture type decision processing which was mentioned above and which can be changedwhen a picture type is changed into the second generation from the 1st generation. All the motion vectors calculated when video (the 0th generation) was changed into the 1st generation will be in the state (left behind) where it was saved at picture hysteresis informationat the time of this picture type change. Nextsince the motion vector for every picture type when changed into the 1st generation from the 0th generation is saved when again changed into Long GOP (a picture type is changed into the third generation from the second generation)By reusing thisimage quality deterioration is suppressed and it becomes again possible to change into Long GOP.
[0167]Drawing 34 shows other examples of picture type change. In the case of this examplefrom N= 14 and Long GOP (the 1st generation) which is M= 2. It is changed into Short GOP (second generation) which is N= 2 and M= 2the frame number which are N= 1 and M= 1 is further changed into Short GOP (third generation) of 1and frame number N is changed into random GOP (fourth generation).
[0168]Also in this exampleit is saved till the conversion from the third generation of the motion vector for every picture type when changed into the 1st generation from the 0th generation to the fourth generation. Thenas shown in drawing 34even if it changes a picture type intricatelyimage quality deterioration can be small suppressed by reusing the encoding parameter saved. If the quantizing scale of an encoding parameter saved is used effectivelylittle coding of image quality deterioration is realizable.
[0169]Reuse of this quantizing scale is explained with reference to drawing 35. The predetermined frame is always changed into I picture from the 1st generation to the fourth generationand drawing 35 shows that only the bit rate is changed into 4Mbps18Mbpsor 50Mbps.
[0170]For exampleeven if it carries out recoding with a fine quantizing scale with improvement in the speed of the bit rate in the case of the conversion to the second generation (18Mbps) from the 1st generation (4Mbps)image quality does not improve. It is because the data

quantized by the coarse quantization step in the past is not restored. Thereforeas shown in drawing 35even if the bit rate accelerates on the waythe amount of information only increases and quantizing by a fine quantization step in connection with it does not lead to improvement in image quality. Thereforeif it controls to maintain the past coarsest (large) quantizing scalethere will be no futility and efficient coding will be attained.
[0171]As mentioned abovewhen the bit rate is changedcoding using the history of the past quantizing scale is dramatically effective.
[0172]This quantized control processing is explained with reference to the flow chart of drawing 36. In Step S11the encoding parameter decollator 105 judges whether the encoding parameter of the picture type changed from now exists in the inputted picture hysteresis information. When judged with the encoding parameter of the picture type to change existingit progresses to Step S12.
[0173]In Step S12the encoding parameter decollator 105 extracts a quantizing scale (Q_history) from the encoding parameter used as contrast of picture hysteresis information.
[0174]In Step S13the encoding parameter decollator 105 reads in the transmission buffer 59 candidate value Q_feedback of the quantizing scale fed back to the quantization circuit 57.
[0175]In Step S14the encoding parameter decollator 105 judges whether it is that Q_history is larger (coarse) than Q_feedback. When judged with Q_history being larger than Q_feedbackit progresses to Step S15.
[0176]In Step S15the encoding parameter decollator 105 outputs Q_history to the quantization circuit 57 as a quantizing scale. The quantization circuit 57 performs quantization using Q_history.
[0177]In Step S16it is judged whether all the macro blocks contained in a frame were quantized. When judged with no macro blocks being quantizedit returns to Step S13and processing of Steps S13 thru/or S16 is repeated until all the macro blocks are quantized.
[0178]In Step S14when Q_history is judged to be ** (fine) which is not larger than Q_feedbackit progresses to Step S17.
[0179]In Step S17the encoding parameter decollator 105 outputs Q_feedback to the quantization circuit 57 as a quantizing scale. The quantization circuit 57 performs quantization using Q_feedback.
[0180]In Step S11when judged with the encoding parameter of the picture type to change not existingit progresses to Step S18.
[0181]In Step S18the quantization circuit 57 receives candidate value Q_feedback of the quantizing scale fed back from the transmission buffer 59.
[0182]In Step S19the quantization circuit 57 performs quantization using Q_feedback.
[0183]In Step S20it is judged whether all the macro blocks contained in a frame were quantized. When judged with no macro blocks being quantizedit returns to Step S18and processing of Steps S18 thru/or S20 is repeated until all the macro blocks are quantized.
[0184]Although rough union is carried outand the decoding side and the numerals side made image data multiplex an encoding parameter and made it transmit in the inside of the transformer coder 101 in this embodiment as mentioned aboveas shown in drawing 37the decoding device 102 and the coding equipment 106 are connected with the high speed bus 111 for encoding parameter transmission -- it may be made like (it couples closely).
[0185]Drawing 38 is a figure showing the syntax for decoding the video stream of MPEG. A

decoder extracts two or more meaningful data items (data element) from a bit stream by decoding an MPEG bit stream according to this syntax. As for the syntax explained belowthe function and conditional sentence are expressed with a thin printing type in a figureand the data element is expressed with ******. The data item is described by the mnemonic (Mnemonic) who shows the namebit lengthand its type and transmitting order.
[0186]Firstthe function currently used in the syntax shown in this drawing 38 is explained.
[0187]A next_start_code() function is a function for looking for the start code described in the bit stream. Thereforein the syntax shown in this drawing 38 to the next of this next_start_code() function. Since the sequence_header() function and the sequence_extension() function are arranged in orderto this bit stream. The data element defined by this sequence_header() function and a sequence_extension() function is described. Thereforeat the time of decoding of a bit stream. By this next_start_code() functionthe start code (a kind of a data element) described at the head of the sequence_header() function and the sequence_extension() function is found out of a bit streamit is based on it -- a sequence_header() function and a sequence_extension() function are found further and each data element defined by them is decoded.
[0188]A sequence_header() functionIt is a function for defining the header data of the sequence layer of an MPEG bit streamand a sequence_extension() function is a function for defining the extended data of the sequence layer of an MPEG bit stream.
[0189] do{} arranged after the sequence_extension() function -- {} of do [while the conditions by which while syntax is defined by the while sentence are truth] sentence -- it is the syntax for extracting the data element described based on the inner function out of a data stream. That isby do{}while syntaxwhile the conditions defined by the while sentence are truthdecoding which extracts the data element described based on the function in do sentence out of a bit stream is performed.
[0190]The nextbits() function currently used for this while sentence is a function for comparing the bit or bit string which appears in a bit stream with the data element decoded next. In the example of the syntax of this drawing 38a nextbits() functionWhen sequence_end_code which shows the bit string in a bit stream and the end of a video sequence is compared and the bit string and sequence_end_code in a bit stream are not in agreementthe conditions of this while sentence serve as truth. Thereforethe do{}while syntax arranged after the sequence_extension() functionWhile sequence_end_code which shows the end of a video sequence in a bit stream does not appearit is shown that the data element defined by the function in do sentence is described in a bit stream.
[0191]In the bit streamthe data element defined by the extension_and_user_data (0) function is described by the next of each data element defined by the sequence_extension() function. This extension_and_user_data (0) function is a function for defining the extended data and the user datum of a sequence layer of an MPEG bit stream.
[0192]The do{}while syntax arranged after this extension_and_user_data (0) function{} of do [while the conditions defined by the while sentence are truth] sentence -- it is a function for extracting the data element described based on the inner function out of a bit stream. The nextbits() function currently used in this while sentenceIt is a function for judging coincidence with the bit or bit string which appears in a bit streamand picture_start_code or group_start_codeWhen the bit or bit string which appears in a bit streamand

picture_start_code or group_start_code is in agreementthe conditions defined by the while sentence serve as truth. Thereforewhen picture_start_code or group_start_code appears in a bit streamthis do{}while syntax. Since the code of the data element defined by the function in the start codenext do sentence is describedBy discovering the start code shown by this picture_start_code or group_start_codethe data element defined in do sentence can be extracted out of a bit stream.

[0193]In a bit streamif sentence described by the beginning of this do sentence shows the conditions of the case where group_start_code appearsand is. When the conditions by this if sentence are truthin a bit streamThe data element defined as the next of this group_start_code by the group_of_picture_header (1) function and the extension_and_user_data (1) function is described in order.

[0194]This group_of_picture_header (1) functionit is a function for defining the header data of the GOP layer of an MPEG bit stream -- an extension_and_user_data (1) functionIt is a function for defining the extended data (extension_data) and the user datum (user_data) of a GOP layer of an MPEG bit stream.

[0195]To the next of the data element defined by the group_of_picture_header (1) function and the extension_and_user_data (1) function in this bit stream. The data element defined by the picture_header() function and the picture_coding_extension() function is described. Of coursewhen the conditions of if sentence explained previously do not serve as truth. Since the data element defined by the group_of_picture_header (1) function and the extension_and_user_data (1) function is not describedTo the next of the data element defined by the extension_and_user_data (0) function. The data element defined by the picture_header() function and the picture_coding_extension() function is described.

[0196]This picture_header() functionit is a function for defining the header data of the picture layer of an MPEG bit stream -- a picture_coding_extension() function is a function for defining the 1st extended data of the picture layer of an MPEG bit stream.

[0197]The following while sentence is a function for performing conditional judgment of the following if sentencewhile the conditions defined by this while sentence are truth. The nextbits() function currently used in this while sentenceThe bit string which appears in a bit streamand the bit string which is a function for judging coincidence with extension_start_code or user_data_start_codeand appears in a bit streamWhen extension_start_code or user_data_start_code is in agreementthe conditions defined by this while sentence serve as truth.

[0198]1st if sentence is a function for judging coincidence with the bit string and extension_start_code which appear in a bit stream. When the bit string and 32-bit extension_start_code which appear in a bit stream are in agreementIt is shown that the data element defined by the next of extension_start_code by an extension_data (2) function in a bit stream is described.

[0199]2nd if sentence is syntax for judging coincidence with the bit string and user_data_start_code which appear in a bit streamWhen the bit string and 32-bit user_data_start_code which appear in a bit stream are in agreementconditional judgment of 3rd if sentence is performed. This user_data_start_code is a start code for the start of the user data area of the picture layer of an MPEG bit stream to be shown.

[0200]3rd if sentence is syntax for judging coincidence with the bit string and History_Data_ID

which appear in a bit stream. When the bit string which appears in a bit streamand this 8-bit History_Data_ID are in agreementIn the user data area of the picture layer of this MPEG bit streamIt is shown that are a code shown by this 8-bit History_Data_IDnext the data element defined by a converted_history_stream() function is described.

[0201]A converted_history_stream() function is a function for describing the hysteresis information and historical data for transmitting all the encoding parameters used at the time of MPEG coding. The details of the data element defined by this converted_history_stream() function are mentioned later. This History_Data_ID is a start code for the head where these hysteresis information and historical data that were described by the user data area of the picture layer of an MPEG bit stream are described to be shown.

[0202]An else sentence is syntax for that conditions are non-truth to be shown in 3rd if sentence. Thereforein the user data area of the picture layer of this MPEG bit streamWhen the data element defined by the converted_history_stream() function is not describedthe data element defined by the user_data() function is described.

[0203]A picture_data() function is an user datum of the picture layer of an MPEG bit streamnext is a function for describing the data element about a slice layer and a macro block layer. Usuallythe data element shown by this picture_data() functionAlthough described by the next of the data element defined by the data element or user_data() function defined by the converted_history_stream() function described by the user data area of the picture layer of a bit streamWhen extension_start_code or user_data_start_code does not exist in the bit stream which shows the data element of a picture layer****** described by the next of the data element shown by this picture_data() functionand the data element defined by a picture_coding_extension() function.

[0204]After the data element shown by this picture_data() functionthe data element defined by the sequence_header() function and the sequence_extension() function is arranged in order. The data element described by this sequence_header() function and the sequence_extension() functionIt is completely the same as the data element described by the sequence_header() function described at the head of the sequence of a video streamand the sequence_extension() function. Thusthe reason for describing the same data in a streamWhen reception is started by the bit stream receiving set side from the middle (for examplebit stream portion corresponding to a picture layer) of a data streamit is for preventing that it becomes impossible to receive the data of a sequence layerand it becomes impossible to decode a stream.

[0205]The next of the data element defined by the sequence_header() function and sequence_extension() function of this lastThat is32-bit sequence_end_code which shows the end of a sequence is described by the last of the data stream.

[0206]When the outline of the fundamental composition of the above syntax is shownit comes to be shown in drawing 39.

[0207]Nextthe history stream defined by the converted_history_stream() function is explained.

[0208]This converted_history_stream() is a function for inserting in the user data area of the picture layer of MGEG the history stream which shows hysteresis information. In order that the meaning of "converted" may prevent a start emulationIt means being the stream which performed the conversion process which inserts a marker bit (1 bit) every at least 22 bits of the history stream which comprises historical data which should be inserted in user area.

[0209]This converted_history_stream() is described by in the form of [of explaining below]

either a fixed-length history stream (drawing 40 thru/or drawing 46) or a variable-length history stream (drawing 47). When a fixed-length history stream is chosen as the encoder sidethere is a merit that the circuit and software for decoding each data element from a history stream to the decoder side become easy. On the other handwhen a variable-length history stream is chosen as the encoder sideSince the hysteresis information (data element) described by the user area of a picture layer in an encoder can be chosen arbitrarily if neededThe data rate of the whole bit stream which could lessen data volume of the history stream and was coded as a result can be reduced.

[0210]"Hysteresis information"the "historical data"and the "history parameter" which are explained in this invention are an encoding parameter (or data element) used in the past coding processingand are not an encoding parameter used in the present coding processing (final stage). for example-- coding and transmitting a certain picture by I picture in the 1st-generation coding processing -- the next -- in coding processing of the second generationShortlyit codes as a P picturethis picture is transmittedand the example which codes and transmits this picture by B picture is further given and explained in coding processing of the third generation. The encoding parameter used in coding processing of the third generation is described by the prescribed position of the sequence layer of the encoded bit streams generated in coding processing of the third generationa GOP layerthe picture layerthe slice layerand the macro block layer. The encoding parameter used on the other hand in the coding processing of the 1st generation and the second generation which is the past coding processingIf described by the sequence layer and GOP layer the encoding parameter used in coding processing of the third generation is described to bethere is nothingand according to the already explained syntaxit is described by the user data area of a picture layer as hysteresis information of an encoding parameter.

[0211]Firstfixed-length history stream syntax is explained with reference to drawing 40 thru/or drawing 46.

[0212]In the user area of the picture layer of the bit stream generated in coding processing of a final stage (for examplethird generation). Firstthe encoding parameter about the sequence header of the sequence layer currently used in the past (for examplethe 1st generation and the second generation) coding processing is inserted as a history stream. Hysteresis informationsuch as a sequence header etc. of the sequence layer of the bit stream generated in the past coding processingshould be noticed about the point of not being inserted in the sequence header of the sequence layer of the bit stream generated in coding processing of a final stage.

[0213]The data element about the sequence header used by the past coding processingsequence_header_codesequence_header_present_flaghorizontal_size_valuevertical_size_valueaspect_ratio_informationframe_rate_codebit_rate_valuemarker_bitVBV_buffer_size_valueconstrained_parameter_flagload_intra_quantizer_matrixIt comprises intra_quantizer_matrixload_non_intra_quantizer_matrixnon_intra_quantizer_matrixetc.

[0214]sequence_header_code is data showing the start synchronization code of a sequence layer. sequence_header_present_flag is data in which it is shown whether the data in sequence_header is effective or invalid. horizontal_size_value is data which comprises 12 bits of low ranks of the horizontal pixel number of a picture. vertical_size_value is data which consists of 12 bits of low ranks of the line number of the length of a picture.

aspect_ratio_information is data showing the aspect ratio (aspect ratio) or display screen aspect ratio of a pixel. frame_rate_code is data showing the display period of a picture.
[0215]bit_rate_value is 18 bits (it revalues per 400bsp) of low rank data of the bit rate for the restriction to a generation bit amount. marker_bit is bit data inserted in order to prevent a start code emulation. VBV_buffer_size_value is low rank 10 bit data of the value which determines the size of the virtual buffer for generated code amount control (video buffer verifier). constrained_parameter_flag is data in which it is shown that each parameter is less than restriction. load_intra_quantizer_matrix is data in which existence of the quantizing-matrix data for the intra MB is shown. intra_quantizer_matrix is data in which the value of the quantizing matrix for the intra MB is shown. load_non_intra_quantizer_matrix is data in which existence of the quantizing-matrix data for the non-intra MB is shown. non_intra_quantizer_matrix is data showing the value of the quantizing matrix for the non-intra MB.
[0216]Nextthe data element which expresses the sequence extension of the sequence layer used in the past coding processing to the user area of the picture layer of the bit stream generated in coding processing of a final stage is described as a history stream.
[0217]The data element showing the sequence extension used by coding processing of this pastextension_start_codeextension_start_code_identifiersequence_extension_present_flagprofile_and_level_indicationprogressive_sequencechroma_formathorizontal_size_extensionvertical_size_extensionbit_rate_extensionThey are data elementssuch as vbv_buffer_size_extensionlow_delayframe_rate_extension_nand frame_rate_extension_d.
[0218]extension_start_code is data showing the start synchronization code of extension data. extension_start_code_identifier is data in which it is shown which extended data is sent. sequence_extension_present_flag is data in which it is shown whether the data within a sequence extension is effective or invalid. profile_and_level_indication is data for specifying the profile and level of a video data. progressive_sequence is data in which it is shown that a video data is sequential scanning. chroma_format is data for specifying the color difference format of a video data.
[0219]horizontal_size_extension is top 2-bit data added to horizntal_size_value of a sequence header. vertical_size_extension is top 2-bit data added to vertical_size_value of a sequence header. bit_rate_extension is top 12-bit data added to bit_rate_value of a sequence header. vbv_buffer_size_extension is top 8-bit data added to vbv_buffer_size_value of a sequence header. low_delay is data in which it is shown that B picture is not included. frame_rate_extension_n is data for obtaining a frame rate combining frame_rate_code of a sequence header. frame_rate_extension_d is data for obtaining a frame rate combining frame_rate_code of a sequence header.
[0220]Thenthe data element which expresses the sequence display extension of the sequence layer used in the past coding processing to the user area of the picture layer of a bit stream is described as a history stream.
[0221]The data element described as this sequence display extensionextension_start_codeextension_start_code_identifiersequence_display_extension_present_flagvideo_formatcolor_descriptionIt comprises color_primariestransfer_characteristicsmatrix_coeffientsdisplay_horizontal_sizeand display_vertical_size.
[0222]extension_start_code is data showing the start synchronization code of extension data.

extension_start_code_identifier is a code which shows which extended data is sent. sequence_display_extension_present_flag is data in which it is shown whether the data element within a sequence display extension is effective or invalid. video_format is data showing the video image format of the HARASHIN item. color_description is data in which it is shown that there is detailed data of a color space. color_primaries is data in which the details of the color characteristic of the HARASHIN item are shown. transfer_characteristics is data in which the details of how photoelectric conversion was performed are shown. matrix_coeffients is data in which the details of how the HARASHIN item was changed from the three primary colors of light are shown. display_horizontal_size is data showing the active region (horizontal size) of the display to mean. display_vertical_size is data showing the active region (vertical size) of the display to mean.

[0223]Thento the user area of the picture layer of the bit stream generated in coding processing of a final stage. The macro block assignment data (macroblock_assignment_in_user_data) in which the topology of the macro block generated in the past coding processing is shown is described as a history stream.

[0224]macroblock_assignment_in_user_data which shows the topology of this macro block comprises data elementssuch as macroblock_assignment_present_flagv_phaseand h_phase.

[0225]This macroblock_assignment_present_flag is data in which it is shown whether the data element in macroblock_assignment_in_user_data is effective or invalid. v_phase is data in which the topology of the perpendicular direction at the time of starting a macro block from image data is shown. h_phase is data in which the horizontal topology at the time of starting a macro block from image data is shown.

[0226]Thenthe data element which expresses the GOP header of the GOP layer used in the past coding processing to the user area of the picture layer of the bit stream generated by coding processing of the final stage is described as a history stream.

[0227]The data element showing this GOP header comprises group_start_codegroup_of_picture_header_present_flagtime_codeclosed_gopand broken_link.

[0228]group_start_code is data in which the start synchronization code of a GOP layer is shown. It is data in which it is shown whether the data element in group_of_picture_header_present_flag and group_of_picture_header is effective or invalid. time_code is a time code which shows the time from the head of the sequence of the leading picture of GOP. closed_gop is flag data in which a thing with a picture refreshable independently of other GOP(s) in GOP is shown. broken_link is flag data in which it is shown that B picture of the head in GOP cannot be correctly reproduced because of edit etc.

[0229]Thenthe data element which expresses the picture header of the picture layer used in the past coding processing to the user area of the picture layer of the bit stream generated by coding processing of the final stage is described as a history stream.

[0230]The data element about this picture headerpicture_start_codetemporal_referenceIt comprises picture_coding_typevbv_delayfull_pel_forward_vectorforward_f_codefull_pel_backward_vectorand backward_f_code.

[0231]Specificallypicture_start_code is data showing the start synchronization code of a picture layer. temporal_reference is data reset at the head of GOP by the number which shows the display order of a picture. picture_coding_type is data in which a picture type is shown.

vbv_delay is data in which the initial state of the virtual buffer at the time of random access is shown. full_pel_forward_vector is data which the accuracy of a forward direction motion vector shows an integer unit or a half a pixel unit. forward_f_code is data showing a forward direction motion vector search range. full_pel_backward_vector is data which the accuracy of an opposite direction motion vector shows an integer unit or a half a pixel unit. backward_f_code is data showing an opposite direction motion vector search range.
[0232]Thenthe picture coding extension of the picture layer used in the past coding processing is described by the user area of the picture layer of the bit stream generated by coding processing of the final stage as a history stream.
[0233]The data element about this picture coding extensionextension_start_codeextension_start_code_identifierf_code [0][0]f_code [0] and [1]f_code [1][0]f_code [1][1]intra_dc_precisionpicture_structuretop_field_firstframe_predictive_frame_dctconcealment_motion_vectorsq_scale_typeintra_vlc_formatalternate_scanrepeat_firt_fieldchroma_420_typeIt comprises progressive_framecomposite_display_flagv_axisfield_sequencesub_carrierburst_amplitudeand sub_carrier_phase.
[0234]extension_start_code is a start code which shows the start of the extension data of a picture layer. extension_start_code_identifier is a code which shows which extended data is sent. f_code [0] and [0] are data showing the level motion vector search range of the direction of a forward. f_code [0] and [1] are data showing the vertical motion vector search range of the direction of a forward. f_code [1] and [0] are data showing the level motion vector search range of the backward direction. f_code [1] and [1] are data showing the vertical motion vector search range of the backward direction.
[0235]intra_dc_precision is data showing the accuracy of a DC coefficient. picture_structure is data in which a frame structure or a field structure is shown. In the case of a field structurethey are the higher rank fieldthe low rank fieldor data set and shown. In the case of a frame structuretop_field_first is data which the first field shows a higher rank or a low rank. frame_predictive_frame_dct is data in which it is shown in the case of a frame structure that prediction of frame mode DCT is only a frame mode. concealment_motion_vectors is data in which it is shown that the motion vector for concealing a transmission error is attached to the Intra macro block.
[0236]q_scale_type is data in which it is shown whether a linear quantization scale is used or a nonlinear quantization scale is used. intra_vlc_format is data in which it is shown whether another two-dimensional VLC is used for the Intra macro block. alternate_scan is data showing selection of whether a zigzag scan is used or to use an alternate scan. repeat_firt_field is data used 2:3 when pulldown. When the signal format of chroma_420_type is 4:2:0they are the same value as following progressive_frameand data which expresses 0 when that is not right. progressive_frame is data in which it is shown whether this picture can be scanned sequentially. composite_display_flag is data in which it is shown whether the source signal was a composite signal.
[0237]v_axis is data in which a source signal is used in the case of PAL. field_sequence is data in which a source signal is used in the case of PAL. sub_carrier is data in which a source signal is used in the case of PAL. burst_amplitude is data in which a source signal is used in the case of

PAL. sub_carrier_phase is data in which a source signal is used in the case of PAL.
[0238]Thenthe quantizing-matrix extension used in the past coding processing is described by the user area of the picture layer of the bit stream generated by coding processing of the final stage as a history stream.
[0239]The data element about this quantizing-matrix extensionextension_start_codeextension_start_code_identifierquant_matrix_extension_present_flagload_intra_quantizer_matrixintra_quantizer_matrix [64]load_non_intra_quantizer_matrixnon_intra_quantizer_matrix [64]load_chroma_intra_quantizer_matrixIt comprises chroma_intra_quantizer_matrix [64]load_chroma_non_intra_quantizer_matrixand chroma_non_intra_quantizer_matrix [64].
[0240]extension_start_code is a start code which shows the start of this quantizing-matrix extension. extension_start_code_identifier is a code which shows which extended data is sent. quant_matrix_extension_present_flag is data for whether the data element within this quantizing-matrix extension is effective or invalid to be shown. load_intra_quantizer_matrix is data in which existence of the quantization matrix data for Intra macro blocks is shown. intra_quantizer_matrix is data in which the value of the quantizing matrix for Intra macro blocks is shown.
[0241]load_non_intra_quantizer_matrix is data in which existence of the quantization matrix data for non-Intra macro blocks is shown. non_intra_quantizer_matrix is data showing the value of the quantizing matrix for non-Intra macro blocks. load_chroma_intra_quantizer_matrix is data in which existence of the quantizing-matrix data for color difference Intra macro blocks is shown. chroma_intra_quantizer_matrix is data in which the value of the quantizing matrix for color difference Intra macro blocks is shown. load_chroma_non_intra_quantizer_matrix is data in which existence of the quantizing-matrix data for color difference non-Intra macro blocks is shown. chroma_non_intra_quantizer_matrix is data in which the value of the quantizing matrix for color difference non-Intra macro blocks is shown.
[0242]Thenthe copyright extension used in the past coding processing is described by the user area of the picture layer of the bit stream generated by coding processing of the final stage as a history stream.
[0243]The data element about this copyright extensionextension_start_codeextension_start_code_itentifiercopyright_extension_present_flagIt comprises copyright_flagcopyright_identifieroriginal_or_copycopyright_number_1copyright_number_2and copyright_number_3.
[0244]extension_start_code is a start **** start code of a copyright extension. It is a code which shows whether the extension data of an extension_start_code_itentifier throat is sent. copyright_extension_present_flag is data for whether the data element within this copyright extension is effective or invalid to be shown. copyright_flag shows whether the right of a copy is granted to the coded video data to a following copyright extension or sequence end.
[0245]copyright_identifier is data for identifying the registration agency of the right of a copy specified by ISO/IEC JTC/SC29. original_or_copy is data in which it is shown whether the data in a bit stream is original data or it is copy data. copyright_number_1 is data showing the bits 44-63 of a copyright number. copyright_number_2 is data showing the bits 22-43 of a copyright number. copyright_number_3 is data showing the bits 0-21 of a copyright number.

[0246]Thento the user area of the picture layer of the bit stream generated by coding processing of the final stage. The picture display extension (picture_display_extension) used in the past coding processing is described as a history stream.
[0247]The data element showing this picture display extensionextension_start_codeextension_start_code_identifierpicture_display_extension_present_flagframe_center_horizontal_offset_1frame_center_vertical_offset_1frame_center_horizontal_offset_2It comprises frame_center_vertical_offset_2frame_center_horizontal_offset_3and frame_center_vertical_offset_3.
[0248]extension_start_code is a start code for the start of a picture display extension to be shown. extension_start_code_identifier is a code which shows which extended data is sent. picture_display_extension_present_flag is data in which it is shown whether the data element within a picture display extension is effective or invalid. frame_center_horizontal_offset is data in which horizontal offset of display area is shownand can be defined to three offset values. frame_center_vertical_offset is data in which vertical offset is shownand can define display area to three offset values.
[0249]The user datum used in coding processing of the hysteresis information which expresses the already explained picture display extension to the user area of the picture layer of the bit stream generated in coding processing of a final stagenext the past is described as a history stream.
[0250]The information about the macro block layer used in the past coding processing is described as a history stream by the next of this user datum.
[0251]The information about this macro block layer macroblock_address_hThe data element about the position of macro blockssuch as macroblock_address_vslice_header_present_flagand skipped_macroblock_flagmacroblock_quantmacroblock_motion_forwardmacroblock_motion_backwardmocroblock_patternmacroblock_intraspatial_temporal_weight_code_flagThe data element about macro block modessuch as frame_motion_type and dct_typeThe data element about quantization step control of quantiser_scale_code etc.[PMV [0][0][0]PMV [0] and [0]1]motion_vertical_field_select [0] and [0]PMV [0][1] and [0]PMV [0][1] and [1]motion_vertical_field_select [0][1][PMV [1][0][0]PMV [1] and [0]1]motion_vertical_field_select [1][0]The data element about motion compensationssuch as PMV [1][1][0]PMV [1][1] and [1]motion_vertical_field_select [1][1]It comprises a data element about macro block patternssuch as coded_block_patternand a data element about generated code amountssuch as num_mv_bitsnum_coef_bitsand num_other_bits.
[0252]The data element about a macro block layer is explained in detail below.
[0253]macroblock_address_h is data for defining the horizontal absolute position of the present macro block. macroblock_address_v is data for defining the absolute position of the perpendicular direction of the present macro block. This macro block is a head of a slice layerand slice_header_present_flag is data in which it is shown whether it is accompanied by a slice header. skipped_macroblock_flag is data in which it is shown whether this macro block is skipped in decoding processingand is **.
[0254]macroblock_quant is data led from the macro block type (macroblock_type) shown in drawing 65 thru/or drawing 67 mentioned laterand is data in which it is shown whether quantiser_scale_code appears in a bit stream. macroblock_motion_forward is data led from the

macro block type shown in drawing 65 thru/or drawing 67and is data used by decoding processing. macroblock_motion_backward is data led from the macro block type shown in drawing 65 thru/or drawing 67and is data used by decoding processing. mocroblock_pattern is data led from the macro block type shown in drawing 65 thru/or drawing 67and is data in which it is shown whether coded_block_pattern appears in a bit stream.
[0255]macroblock_intra is data led from the macro block type shown in drawing 65 thru/or drawing 67and is data used by decoding processing. spatial_temporal_weight_code_flagIt is data led from the macro block type shown in drawing 65 thru/or drawing 67spatial_temporal_weight_code which shows the rise sampling of a low order layer picture with time scalability is data in which it is shown whether it exists in a bit stream.
[0256]frame_motion_type is a 2-bit code which shows the prediction type of the macro block of a frame. It is "00" if an estimated vector is a prediction type of a field base in two piecesIt is "11" if it is "10" if it is "01" if an estimated vector is a prediction type of a field base in one pieceand an estimated vector is a prediction type of a frame base in one pieceand an estimated vector is a prediction type of a DIARU prime in one piece. field_motion_type is a 2-bit code which shows the motion prediction of the macro block of the field. It is "11" if it is "10" if it is "01" if an estimated vector is a prediction type of a field base in one pieceand an estimated vector is a prediction type of an 18x8 macro-block base in two piecesand an estimated vector is a prediction type of a DIARU prime in one piece. dct_type is data which DCT shows frame DCT mode and field DCT mode. quantiser_scale_code is data in which the quantization step size of a macro block is shown.
[0257]Nextthe data element about a motion vector is explained. A motion vector is coded as difference about the vector coded previouslyin order to decrease a motion vector required at the time of decoding. In order to decode a motion vectorthe decoder must maintain the motion vector predicted value (level respectively and accompanied by a vertical component) of four pieces. This prediction motion vector is expressed as PMV [r] and [s] [v]. [r] whether the motion vector in a macro block is the 1st vector. It is a flag which shows whether it is the 2nd vectorwhen the vector in a macro block is the 1st vectorit is set to "0"and it is set to "1" when the vector in a macro block is the 2nd vector. [s] is a flag which shows whether it is front and whether the direction of the motion vector in a macro block is the backin the case of a front motion vectoris set to "0"andin the case of a back motion vectoris set to "1." [v] It is a flag which shows whether it is horizontal and perpendicularand in the case of a horizontal componentthe ingredient of the vector in a macro block is set to "0"andin the case of a perpendicular direction ingredientis set to "1."
[0258]ThereforePMV [0][0]and [0] express the data of the horizontal component of the motion vector of the front of the 1st vectorand PMV [0][0]and [1]Express the data of the perpendicular direction ingredient of the motion vector of the front of the 1st vectorand PMV [0][1]and [0]Express the data of the horizontal component of the motion vector of the back of the 1st vectorand PMV [0][1]and [1]the data of the perpendicular direction ingredient of the motion vector of the back of the 1st vector is expressed -- PMV [1][0]and [0]Express the data of the horizontal component of the motion vector of the front of the 2nd vectorand PMV [1][0]and [1]the data of the perpendicular direction ingredient of the motion vector of the front of the 2nd vector is expressed -- PMV [1][1]and [0]Expressing the data of the horizontal component of the motion vector of the back of the 2nd vectorPMV [1][1]and [1] express the data of the

perpendicular direction ingredient of the motion vector of the back of the 2nd vector.
[0259]motion_vertical_field_select [r] and [s] are data which shows whether which reference field is used in the form of prediction. When this motion_vertical_field_select [r] and [s] are "0"using a top reference field and using a bottom product reference field in the case of "1" is shown.
[0260]motion_vertical_field_select [0] and [0][therefore] The reference field at the time of generating the motion vector of the front of the 1st vector is shownand motion_vertical_field_select [0] and [1]The reference field at the time of generating the motion vector of the back of the 1st vector is shownand motion_vertical_field_select [1] and [0]The reference field at the time of generating the motion vector of the front of the 2nd vector is shownand motion_vertical_field_select [1] and [1] show the reference field at the time of generating the motion vector of the back of the 2nd vector.
[0261]coded_block_pattern is variable-length data in which it is shown which DCT blocks have a significant coefficient (un-0 coefficient) among two or more DCT blocks which store a DCT coefficient. num_mv_bits is data in which the code amount of the motion vector in a macro block is shown. num_coef_bits is data in which the code amount of the DCT coefficient in a macro block is shown. num_other_bits is a code amount of a macro block and is data in which code amounts other than a motion vector and a DCT coefficient are shown.
[0262]Nextthe syntax for decoding each data element from a variable-length history stream is explained with reference to drawing 47 thru/or drawing 64.
[0263]This variable-length history stream A next_start_code() functionA sequence_header() functiona sequence_extension() functionAn extension_and_user_data (0) functiona group_of_picture_header() functionAn extension_and_user_data (1) functiona picture_header() functionIt is constituted by the data element defined by the picture_coding_extension() functionthe extension_and_user_data (2) functionand the picture_data() function.
[0264]A next_start_code() functionSince it is a function for looking for the start code which exists in a bit streamat the very head of a history streamIt is the data element used in coding processing of the past as shown in drawing 48and the data element defined by the sequence_header() function is described.
[0265]The data element defined by the sequence_header() functionsequence_header_codesequence_header_present_flaghorizontal_size_valuevertical_size_valueaspect_ratio_informationframe_rate_codebit_rate_valuemarker_bitVBV_buffer_size_valueconstrained_parameter_flagload_intra_quantizer_matrixThey are intra_quantizer_matrixload_non_intra_quantizer_matrixnon_intra_quantizer_matrixetc.
[0266]sequence_header_code is data showing the start synchronization code of a sequence layer. sequence_header_present_flag is data in which it is shown whether the data in sequence_header is effective or invalid. horizontal_size_value is data which comprises 12 bits of low ranks of the horizontal pixel number of a picture. vertical_size_value is data which consists of 12 bits of low ranks of the line number of the length of a picture. aspect_ratio_information is data showing the aspect ratio (aspect ratio) or display screen aspect ratio of a pixel. frame_rate_code is data showing the display period of a picture. bit_rate_value is 18 bits (it revalues per 400bsp) of low rank data of the bit rate for the restriction to a generation bit amount.

[0267]marker_bit is bit data inserted in order to prevent a start code emulation. VBV_buffer_size_value is low rank 10 bit data of the value which determines the size of the virtual buffer for generated code amount control (video buffer verifier). constrained_parameter_flag is data in which it is shown that each parameter is less than restriction. load_intra_quantizer_matrix is data in which existence of the quantizing-matrix data for the intra MB is shown. intra_quantizer_matrix is data in which the value of the quantizing matrix for the intra MB is shown. load_non_intra_quantizer_matrix is data in which existence of the quantizing-matrix data for the non-intra MB is shown. non_intra_quantizer_matrix is data showing the value of the quantizing matrix for the non-intra MB.
[0268]The data element defined as the next of the data element defined by the sequence_header() function by the sequence_extension() function as shown by drawing 49 is described as a history stream.
[0269]With the data element defined by the sequence_extension() function. extension_start_codeextension_start_code_identifiersequence_extension_present_flagprofile_and_level_indicationprogressive_sequencechroma_formathorizontal_size_extensionvertical_size_extensionbit_rate_extensionThey are data elementssuch as vbv_buffer_size_extensionlow_delayframe_rate_extension_nand frame_rate_extension_d.
[0270]extension_start_code is data showing the start synchronization code of extension data. extension_start_code_identifier is data in which it is shown which extended data is sent. sequence_extension_present_flag is SUDETA which shows whether the data within a sequence extension is effective or invalid. profile_and_level_indication is data for specifying the profile and level of a video data. progressive_sequence is data in which it is shown that a video data is sequential scanning. chroma_format is data for specifying the color difference format of a video data. horizontal_size_extension is top 2-bit data added to horizntal_size_value of a sequence header. vertical_size_extension is top 2-bit data which is a sequence header and which vertical_size_value adds. bit_rate_extension is top 12-bit data added to bit_rate_value of a sequence header. vbv_buffer_size_extension is top 8-bit data added to vbv_buffer_size_value of a sequence header.
[0271]low_delay is data in which it is shown that B picture is not included. frame_rate_extension_n is data for obtaining a frame rate combining frame_rate_code of a sequence header. frame_rate_extension_d is data for obtaining a frame rate combining frame_rate_code of a sequence header.
[0272]The data element defined as the next of the data element defined by the sequence_extension() function by the extension_and_user_data (0) function as shown in drawing 50 is described as a history stream. An extension_and_user_data(i) functionWhen "i" is except twothe data element defined by an extension_data() function describes only the data element defined by a user_data() function as a history streamwithout describing. Thereforeonly the data element defined by the extension_and_user_data (0) function and a user_data() function is described as a history stream.
[0273]A user_data() function describes an user datum as a history stream based on syntax as shown in drawing 51.
[0274]In the next of the data element defined by the extension_and_user_data (0) function. The data element defined by the group_of_picture_header() function as shown in drawing 52and the data element defined by an extension_and_user_data (1) function are described as a

history stream. Howeveronly when group_start_code which shows the start code of a GOP layer in a history stream is describedThe data element defined by the group_of_picture_header() function and the data element defined by an extension_and_user_data (1) function are described.

[0275]The data element defined by the group_of_picture_header() functionIt comprises group_start_codegroup_of_picture_header_present_flagtime_codeclosed_gopand broken_link.

[0276]group_start_code is data in which the start synchronization code of a GOP layer is shown. It is data in which it is shown whether the data element in group_of_picture_header_present_flag and group_of_picture_header is effective or invalid. time_code is a time code which shows the time from the head of the sequence of the leading picture of GOP. closed_gop is flag data in which a thing with a picture refreshable independently of other GOP(s) in GOP is shown. broken_link is flag data in which it is shown that B picture of the head in GOP cannot be correctly reproduced because of edit etc.

[0277]Only the data element defined by a user_data() function is described as a history stream like an extension_and_user_data (1) function and an extension_and_user_data (0) function.

[0278]When group_start_code which shows the start code of a GOP layer does not exist in a history streamThe data element defined by these group_of_picture_header() functions and an extension_and_user_data (1) function is not described in the history stream. In that caseit is the data element defined by the extension_and_user_data (0) functionnext the data element defined by the picture_headr() function is described as a history stream.

[0279]The data element defined by the picture_headr() functionAs shown in drawing 53picture_start_codetemporal_referencepicture_coding_typevbv_delayfull_pel_forward_vectorThey are forward_f_codefull_pel_backward_vectorbackward_f_codeextra_bit_pictureand extra_information_picture.

[0280]Specificallypicture_start_code is data showing the start synchronization code of a picture layer. temporal_reference is data reset at the head of GOP by the number which shows the display order of a picture. picture_coding_type is data in which a picture type is shown. vbv_delay is data in which the initial state of the virtual buffer at the time of random access is shown. full_pel_forward_vector is data which the accuracy of a forward direction motion vector shows an integer unit or a half a pixel unit. forward_f_code is data showing a forward direction motion vector search range. full_pel_backward_vector is data which the accuracy of an opposite direction motion vector shows an integer unit or a half a pixel unit. backward_f_code is data showing an opposite direction motion vector search range. extra_bit_picture is a flag which shows existence of the additional information which follows. When this extra_bit_picture is "1"extra_information_picture exists nextand when extra_bit_picture is "0"it is shown that there is no data following this. extra_information_picture is the information reserved in the standard.

[0281]The data element defined as the next of the data element defined by the picture_headr() function by the picture_coding_extension() function as shown in drawing 54 is described as a history stream.

[0282]With the data element defined by this picture_coding_extension() function. extension_start_codeextension_start_code_identifierf_code [0][0]f_code [0] and [1]f_code [1][0]f_code [1][1]intra_dc_precisionpicture_structuretop_field_firstframe_predictive_frame_dctconcealme

nt_motion_vectorsq_scale_typeintra_vlc_formatalternate_scanrepeat_firt_fieldchroma_420_typeIt comprises progressive_framecomposite_display_flagv_axisfield_sequencesub_carrierburst_amplitudeand sub_carrier_phase.

[0283]extension_start_code is a start code which shows the start of the extension data of a picture layer. extension_start_code_identifier is a code which shows which extended data is sent. f_code [0] and [0] are data showing the level motion vector search range of the direction of a forward. f_code [0] and [1] are data showing the vertical motion vector search range of the direction of a forward. f_code [1] and [0] are data showing the level motion vector search range of the backward direction. f_code [1] and [1] are data showing the vertical motion vector search range of the backward direction. intra_dc_precision is data showing the accuracy of a DC coefficient.

[0284]picture_structure is data in which a frame structure or a field structure is shown. In the case of a field structurethey are the higher rank fieldthe low rank fieldor data set and shown. In the case of a frame structuretop_field_first is data which the first field shows a higher rank or a low rank. frame_predictive_frame_dct is data in which it is shown in the case of a frame structure that prediction of frame mode DCT is only a frame mode. concealment_motion_vectors is data in which it is shown that the motion vector for concealing a transmission error is attached to the Intra macro block. q_scale_type is data in which it is shown whether a linear quantization scale is used or a nonlinear quantization scale is used. intra_vlc_format is data in which it is shown whether another two-dimensional VLC is used for the Intra macro block.

[0285]alternate_scan is data showing selection of whether a zigzag scan is used or to use an alternate scan. repeat_firt_field is data used 2:3 when pulldown. When the signal format of chroma_420_type is 4:2:0they are the same value as following progressive_frameand data which expresses 0 when that is not right. progressive_frame is data in which it is shown whether this picture can be scanned sequentially. composite_display_flag is data in which it is shown whether the source signal was a composite signal. v_axis is data in which a source signal is used in the case of PAL. field_sequence is data in which a source signal is used in the case of PAL. sub_carrier is data in which a source signal is used in the case of PAL. burst_amplitude is data in which a source signal is used in the case of PAL. sub_carrier_phase is data in which a source signal is used in the case of PAL.

[0286]The data element defined by extensions_and_user_data (2) is described as a history stream by the next of the data element defined by the picture_coding_extension() function. This extension_and_user_data (2) functionAs shown in drawing 50when an extension start code (extension_start_code) exists in a bit streamthe data element defined by an extension_data() function is described. When an user-datum start code (user_data_start_code) exists in a bit streamthe data element defined by a user_data() function is described by the next of this data element. Howeverwhen an extension start code and an user-datum start code do not exist in a bit streamthe data element defined by the extension_data() function and a user_data() function is not described in BITTOTO ream.

[0287]The data element an extension_data() function indicates extension_start_code to be as shown in drawing 55A quant_matrix_extension() functiona copyright_extension() functionAnd it is a function for describing data EREMENETO defined by a picture_display_extension()

function as a history stream in a bit stream.
[0288]The data element defined by a quant_matrix_extension() functionAs shown in drawing 56extension_start_codeextension_start_code_identifierquant_matrix_extension_present_flagload_intra_quantizer_matrixintra_quantizer_matrix [64]load_non_intra_quantizer_matrixnon_intra_quantizer_matrix [64]load_chroma_intra_quantizer_matrixThey are chroma_intra_quantizer_matrix [64]load_chroma_non_intra_quantizer_matrixand chroma_non_intra_quantizer_matrix [64].
[0289]extension_start_code is a start code which shows the start of this quantizing-matrix extension. extension_start_code_identifier is a code which shows which extended data is sent. quant_matrix_extension_present_flag is data for whether the data element within this quantizing-matrix extension is effective or invalid to be shown. load_intra_quantizer_matrix is data in which existence of the quantization matrix data for Intra macro blocks is shown. intra_quantizer_matrix is data in which the value of the quantizing matrix for Intra macro blocks is shown.
[0290]load_non_intra_quantizer_matrix is data in which existence of the quantization matrix data for non-Intra macro blocks is shown. non_intra_quantizer_matrix is data showing the value of the quantizing matrix for non-Intra macro blocks. load_chroma_intra_quantizer_matrix is data in which existence of the quantizing-matrix data for color difference Intra macro blocks is shown. chroma_intra_quantizer_matrix is data in which the value of the quantizing matrix for color difference Intra macro blocks is shown. load_chroma_non_intra_quantizer_matrix is data in which existence of the quantizing-matrix data for color difference non-Intra macro blocks is shown. chroma_non_intra_quantizer_matrix is data in which the value of the quantizing matrix for color difference non-Intra macro blocks is shown.
[0291]The data element defined by a copyright_extension() functionLike and extension_start_code which are shown in drawing 57extension_start_code_itentifiercopyright_extension_present_flagIt comprises copyright_flagcopyright_identifieroriginal_or_copycopyright_number_1copyright_number_2and copyright_number_3.
[0292]extension_start_code is a start **** start code of a copyright extension. extension_start_code_itentifier -- it is a code which shows which extension data is sent. copyright_extension_present_flag is data for whether the data element within this copyright extension is effective or invalid to be shown.
[0293]copyright_flag shows whether the right of a copy is granted to the coded video data to a following copyright extension or sequence end. copyright_identifier is data for identifying the registration agency of the right of a copy specified by ISO/IEC JTC/SC29. original_or_copy is data in which it is shown whether the data in a bit stream is original data or it is copy data. copyright_number_1 is data showing the bits 44-63 of a copyright number. copyright_number_2 is data showing the bits 22-43 of a copyright number. copyright_number_3 is data showing the bits 0-21 of a copyright number.
[0294]The data element defined by a picture_display_extension() functionAs shown in drawing 58they are extension_start_code_identifierframe_center_horizontal_offsetframe_center_vertical_offsetetc.
[0295]extension_start_code_identifier is a code which shows which extended data is sent.

frame_center_horizontal_offset is data in which horizontal offset of display area is shownand can define a number of offset values defined by number_of_frame_center_offsets. frame_center_vertical_offset is data in which vertical offset is shown for display area -- a number of offset values defined by number_of_frame_center_offsets can be defined.
[0296]It returns to drawing 47 again and the data element defined by a picture_data() function is described by the next of the data element defined by an extension_and_user_data (2) function as a history stream.
[0297]The data element defined by a picture_data() function is a data element defined by a slice() functionas shown in drawing 59. Howeverwhen slice_start_code which shows the start code of a slice() function does not exist in a bit streamthe data element defined by this slice() function is not described in the bit stream.
[0298]As shown in drawing 60a slice() function slice_start_codeslice_quantiser_scale_codeintra_slice_flagData elementssuch as intra_slicereserved_bitsextra_bit_sliceextra_information_sliceand extra_bit_sliceIt is a function for describing the data element defined by a macroblock() function as a history stream.
[0299]slice_start_code is a start code which shows the start of the data element defined by a slice() function. slice_quantiser_scale_code is data in which the quantization step size set up to the macro block which exists in this slice layer is shown. Howeverwhen quantiser_scale_code is set up for every macro blockit is used by the data of macroblock_quantiser_scale_code set up to each macro blockgiving priority.
[0300]intra_slice_flag is a flag which shows whether intra_slice and reserved_bits exist in a bit stream. intra_slice is data in which it is shown whether a non Intra macro block exists in a slice layer. When either of the macro blocks in a slice layer is a non Intra macro blockintra_slice is set to "0"and intra_slice is set to "1" when all the macro blocks in a slice layer are non Intra macro blocks. reserved_bits is 7-bit data and takes the value of "0." extra_bit_slice is a flag which shows that additional information exists as a history streamand when extra_information_slice next existsit is set as "1." When additional information does not existit is set as "0."
[0301]The data element defined by the macroblock() function is described as a history stream by the next of these data elements.
[0302]As shown in drawing 61a macroblock() function macroblock_escapeData elementssuch as macroblock_address_increment and macroblock_quantiser_scale_codeThey are a macroblock_modes() function and a function for describing the data element defined by macroblock_vecters (s) function.
[0303]macroblock_escape is a fixed bit string which shows whether the horizontal difference of a reference macroblock and a front macro block is 34 or more. When the horizontal difference of a reference macroblock and a front macro block is 34 or more33 is added to the value of macroblock_address_increment. macroblock_address_increment is data in which the horizontal difference of a reference macroblock and a front macro block is shown. If one macroblock_escape exists before this macroblock_address_incrementThe value which added 33 to the value of this macroblock_address_increment serves as data in which the horizontal difference of a actual reference macroblock and a front macro block is shown.
[0304]macroblock_quantiser_scale_code is the quantization step size set up for every macro block. Although slice_quantiser_scale_code which shows the quantization step size of a slice layer is set to each slice layerWhen macroblock_quantiser_scale_code is set up to the reference

macroblockthis quantization step size is chosen.
[0305]The data element defined by a macroblock_modes() function is described by the next of macroblock_address_increment. A macroblock_modes() functionAs shown in drawing 62it is a function for describing data elementssuch as macroblock_typeframe_motion_typefield_motion_typeand dct_typeas a history stream.
[0306]macroblock_type is data in which the coding type of a MAKUROGU block is shown. As shown in drawing 65 thru/or drawing 67specifically macroblock_typeIt is the variable length data generated from flagssuch as macroblock_quantdct_type_flagmacroblock_motion_forwardand macroblock_motion_backward. macroblock_quant as flag ** which shows whether macroblock_quantiser_scale_code for setting up quantization step size to a macro block is set up. When macroblock_quantiser_scale_code exists in a bit streammacroblock_quant takes the value of "1."
[0307]dct_type_flag is a flag (flag which shows whether in other words DCT is carried out) for whether dct_type which shows whether the reference macroblock is coded by frame DCT or field DCT exists to be shownWhen dct_type exists in a bit streamthis dct_type_flag takes the value of "1." macroblock_motion_forward is a flag which shows whether forward prediction of the reference macroblock is carried outand when forward prediction is carried outit takes the value of "1." macroblock_motion_backward is a flag which shows whether backward prediction of the reference macroblock is carried outand when backward prediction is carried outit takes the value of "1."
[0308]When macroblock_motion_forward or macroblock_motion_backward is "1"When picture structure is a frame and frame_period_frame_dct is "0"the data element which expresses frame_motion_type to the next of the data element showing macroblock_type is described. It is a flag which shows whether this frame_period_frame_dct and frame_motion_type exist in a bit stream.
[0309]frame_motion_type is a 2-bit code which shows the prediction type of the macro block of a frame. It is "00" if an estimated vector is a prediction type of a field base in two piecesIt is "11" if it is "10" if it is "01" if an estimated vector is a prediction type of a field base in one pieceand an estimated vector is a prediction type of a frame base in one pieceand an estimated vector is a prediction type of a DIARU prime in one piece.
[0310]When macroblock_motion_forward or macroblock_motion_backward is "1"When there is no picture structure in frame appearancethe data element which expresses field_motion_type to the next of the data element showing macroblock_type is described.
[0311]field_motion_type is a 2-bit code which shows the motion prediction of the macro block of the field. It is "11" if it is "10" if it is "01" if an estimated vector is a prediction type of a field base in one pieceand an estimated vector is a prediction type of an 18x8 macro-block base in two piecesand an estimated vector is a prediction type of a DIARU prime in one piece.
[0312]Picture structure shows with a frame that frame_motion_type exists in a bit stream in frame_period_frame_dctAnd the data element with which it expresses dct_type to the next of the data element showing macroblock_type when frame_period_frame_dct shows that dct_type exists in a bit stream is described. dct_type is data which DCT shows frame DCT mode and field DCT mode.
[0313]Return to drawing 61 againand a reference macroblock is a forward prediction macro

blockor a reference macroblock is the Intra macro blockand in one case of the macro blocks of concealed processing. The data element defined by a motion_vectors (0) function is described. When a reference macroblock is a backward prediction macro blockthe data element defined by a motion_vectors (1) function is described. A motion_vectors (0) function is a function for describing the data element about the motion vector of No. 1and a motion_vectors (1) function is a function for describing the data element about the motion vector of No. 2.
[0314]A motion_vectors (s) function is a function for describing the data element about a motion vectoras shown in drawing 63.
[0315]When the motion vector is not using DIARU prime prediction mode by one piecethe data element defined by motion_vertical_field_select [0][s]and motion_vector (0s) is described.
[0316]This motion_vertical_field_select [r] and [s]The 1st motion vector (it may be which vector of the front or back) is a flag which shows whether it is the vector made with reference to the bottom fieldor it is the vector made with reference to the top field. This index "r" is an index which shows whether it is which vector of the vector of No. 1or the vector of No. 2and is an index with whichas for "s"the prediction direction shows any of the front or backward prediction they are.
[0317]A motion_vector (rs) functionAs shown in drawing 64it is a function for describing the data row about motion_code [r][s]and [t]the data row about motion_residual [r][s]and [t]and the data showing dmvector [t].
[0318]motion_code [r][s]and [t] are variable-length data which expresses the size of a motion vector in -16 - +16. motion_residual [r][s]and [t] are variable-length data showing the remainder of a motion vector. Thereforethe value of this motion_code [r][s][t]and motion_residual [r][s] and [t] can describe a detailed motion vector. In order that dmvector [t] may generate the motion vector in one field (for examplelet a top field be one field to a bottom field) at the time of DIYUARU prime prediction modeThe scale of the existing motion vector is carried out according to the time distanceand in order to make a gap of the perpendicular direction between the lines of a top field and a bottom field reflectit is data which amends to a perpendicular direction. This index "r" is an index which shows whether it is which vector of the vector of No. 1or the vector of No. 2and is an index with whichas for "s"the prediction direction shows any of the front or backward prediction they are. "s" is data in which it is shown whether a motion vector is a vertical ingredient or it is a horizontal ingredient.
[0319]The data row which is shown in drawing 64 and expresses horizontal motion_coder [r][s]and [0] first by a motion_vector (rs) function is described as a history stream. The number of bits of the both sides of motion_residual [0][s][t]and motion_residual [1][s] and [t]Since it is shown by f_code [s] and [t]when f_code [s] and [t] are not 1it will be shown that motion_residual [r][s]and [t] exist in a bit stream. That motion_residual [r] of a horizontal component[s]and [0] are not "1"and motion_code [r] of a horizontal component[s]and [0] are not "0"Since it means that the data element showing motion_residual [r][s]and [0] existsand the horizontal component of a motion vector exists in a bit streamIn that casethe data element showing motion_residual [r] of a horizontal component[s]and [0] is described.
[0320]Thenthe data row showing vertical motion_coder [r][s]and [1] is described as a history stream. Similarly the number of bits of the both sides of motion_residual [0][s][t]and motion_residual [1][s] and [t]Since it is shown by f_code [s] and [t]when f_code [s] and [t] are not 1it will be meant that motion_residual [r][s]and [t] exist in a bit stream. That

motion_residual [r][s]and [1] are not "1"and motion_code [r][s]and [1] are not "0"Since it means that the data element showing motion_residual [r][s]and [1] existsand the perpendicular direction ingredient of a motion vector exists in a bit streamIn that casethe data element showing motion_residual [r] of a perpendicular direction ingredient[s]and [1] is described.
[0321]In a variable length formatin order to decrease the bit rate to transmithysteresis information is reducible.
[0322]Namelyalthough macroblock_type and motion_vectors() transmitsWhen not transmitting quantiser_scale_codethe bit rate can be decreased by setting slice_quantiser_scale_code to "00000."
[0323]Only macroblock_type transmits it and motion_vectors()When not transmitting quantiser_scale_code and dct_typethe bit rate can be decreased by using "not coded" as macroblock_type.
[0324]When transmitting only picture_coding_type and transmitting not all the information below slice() further againthe bit rate can be decreased by using picture_data() without slice_start_code.
[0325]When keeping continuous "0" in user_data from above coming1was inserted every 22 bitsbut it may not be every 22 bits. [23-bit] It is also possible to count the number of continuous "0"and not to insert "1"but to investigate Byte_allign and to make it insert.
[0326]In MPEGalthough 23-bit generating of continuous "0" is forbiddenwhen only the case where 23 bits continues from a byte's head is actually made into a problem and 0 [23-bit] continues not from a byte's head but from the middleit is not considered as a problem. Thereforeit may be made to insert "1" in positions other than LSB every 24 bitsfor example.
[0327]Although hysteresis information was carried out above at the form near video elementary streamit may be made the form near packetized elementary stream or transport stream. It can also be made other places although the place of user_data of Elementary Stream was carried out the picture_data front.
[0328]A user can be provided with the computer program which performs each above-mentioned processing via network distribution mediasuch as the Internet and a digital satellitebesides the distribution medium which consists of information recording mediasuch as a magnetic disk and CD-ROM.
[0329]
[Effect of the Invention]Since the coding hysteresis information inserted in the user data area of the picture layer of a bit stream was decoded like the above according to the decoding device according to claim 1the decoding method according to claim 2and the distribution medium according to claim 3It becomes possible to control degradation of the picture accompanying recoding with the device of a small scale.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]It is a figure explaining the principle of efficient coding.
[Drawing 2]It is a figure explaining the picture type in the case of compressing image data.
[Drawing 3]It is a figure explaining the picture type in the case of compressing image data.

[Drawing 4]It is a figure explaining the principle which codes a dynamic image signal.
[Drawing 5]It is a block diagram coding a dynamic image signal and in which showing the composition of the device to decode.
[Drawing 6]It is a figure explaining format conversion.
[Drawing 7]It is a block diagram showing the composition of the encoder 18 of drawing 5.
[Drawing 8]It is a figure explaining operation of the prediction mode switch circuit 52 of drawing 7.
[Drawing 9]t is a figure explaining operation of the prediction mode switch circuit 52 of drawing 7.
[Drawing 10]It is a figure explaining operation of the prediction mode switch circuit 52 of drawing 7.
[Drawing 11]It is a figure explaining operation of the prediction mode switch circuit 52 of drawing 7.
[Drawing 12]It is a block diagram showing the composition of the decoder 31 of drawing 5.
[Drawing 13]It is a figure explaining the SNR control corresponding to a picture type.
[Drawing 14]It is a block diagram showing the composition of the transformer coder 101 which applied this invention.
[Drawing 15]It is a block diagram showing the more detailed composition of the transformer coder 101 of drawing 14.
[Drawing 16]It is a block diagram showing the composition of the decoder 111 built in the decoding device 102 of drawing 14.
[Drawing 17]It is a figure explaining the pixel of a macro block.
[Drawing 18]It is a figure explaining the field where an encoding parameter is recorded.
[Drawing 19]It is a block diagram showing the composition of the encoder 121 built in the coding equipment 106 of drawing 14.
[Drawing 20]It is a block diagram showing the example of composition of history FOMATTA 211 of drawing 15.
[Drawing 21]It is a block diagram showing the example of composition of the history decoder 203 of drawing 15.
[Drawing 22]It is a block diagram showing the example of composition of the converter 212 of drawing 15.
[Drawing 23] t is a block diagram showing the example of composition of the staff circuit 323 of drawing 22.
[Drawing 24] t is a timing chart explaining operation of the converter 212 of drawing 22.
[Drawing 25]It is a block diagram showing the example of composition of the converter 202 of drawing 15.
[Drawing 26] t is a block diagram showing the example of composition of the DIRITO circuit 343 of drawing 25.
[Drawing 27]It is a block diagram showing other examples of composition of the converter 212 of drawing 15.
[Drawing 28]It is a block diagram showing other examples of composition of the converter 202 of drawing 15.
[Drawing 29]It is a block diagram showing the example of composition of the user-datum formatter 213 of drawing 15.

[Drawing 30]The transformer coder 101 of drawing 14 is a figure showing the state where it is actually used.
[Drawing 31]It is a figure explaining the field where an encoding parameter is recorded.
[Drawing 32]It is a flow chart explaining the picture type decision processing of the coding equipment 106 of drawing 14 which can be changed.
[Drawing 33]It is a figure showing the example in which a picture type is changed.
[Drawing 34]It is a figure showing other examples in which a picture type is changed.
[Drawing 35]It is a figure explaining quantized control processing of the coding equipment 106 of drawing 14.
[Drawing 36]It is a flow chart explaining quantized control processing of the coding equipment 106 of drawing 14.
[Drawing 37]It is a block diagram showing the composition of the transformer coder 101 by which close coupling was carried out.
[Drawing 38]It is a figure explaining the syntax of an MPEG stream.
[Drawing 39]It is a figure explaining the composition of the syntax of drawing 38.
[Drawing 40]It is a figure explaining the syntax of history_stream() which records fixed-length hysteresis information.
[Drawing 41]It is a figure explaining the syntax of history_stream() which records fixed-length hysteresis information.
[Drawing 42]It is a figure explaining the syntax of history_stream() which records fixed-length hysteresis information.
[Drawing 43]It is a figure explaining the syntax of history_stream() which records fixed-length hysteresis information.
[Drawing 44]It is a figure explaining the syntax of history_stream() which records fixed-length hysteresis information.
[Drawing 45]It is a figure explaining the syntax of history_stream() which records fixed-length hysteresis information.
[Drawing 46]It is a figure explaining the syntax of history_stream() which records fixed-length hysteresis information.
[Drawing 47]It is a figure explaining the syntax of history_stream() which records variable-length hysteresis information.
[Drawing 48]It is a figure explaining the syntax of sequence_header().
[Drawing 49]It is a figure explaining the syntax of sequence_extension().
[Drawing 50]It is a figure explaining the syntax of extension_and_user_data().
[Drawing 51]It is a figure explaining the syntax of user_data().
[Drawing 52]It is a figure explaining the syntax of group_of_pictures_header().
[Drawing 53]It is a figure explaining the syntax of picture_header().
[Drawing 54]It is a figure explaining the syntax of picture_coding_extension().
[Drawing 55]It is a figure explaining the syntax of extension_data().
[Drawing 56]It is a figure explaining the syntax of quant_matrix_extension().
[Drawing 57]It is a figure explaining the syntax of copyright_extension().
[Drawing 58]It is a figure explaining the syntax of picture_display_extension().
[Drawing 59]It is a figure explaining the syntax of picture_data().
[Drawing 60]It is a figure explaining the syntax of slice().

[Drawing 61]It is a figure explaining the syntax of macroblock().
[Drawing 62]It is a figure explaining the syntax of macroblock_modes().
[Drawing 63]It is a figure explaining the syntax of motion_vectors (s).
[Drawing 64]It is a figure explaining the syntax of motion_vector (rs).
[Drawing 65]It is a figure explaining the variable length code of macroblock_type to I picture.
[Drawing 66]It is a figure explaining the variable length code of macroblock_type to P picture.
[Drawing 67]It is a figure explaining the variable length code of macroblock_type to B picture.
[Drawing 68]It is a block diagram showing an example of the composition of the conventional transformer coder 131.
[Drawing 69]It is a block diagram showing an example of the composition of the conventional transformer coder 131.
[Drawing 70]It is a figure explaining conventional coding equipment and arrangement of a decoding device.

[Description of Notations]

1 Coding equipment and 2 A decoding device and 3. A recording medium12and 13 A/D converters14 A frame memory and 15 A luminance-signal frame memory16 A color-difference-signal frame memory17 format conversion circuitsand 18 [A luminance-signal frame memory and 35 / A color-difference-signal frame memoryand 36 and 37.] An encoder and 31 A decoder32 format conversion circuitsand 33 A frame memory and 34 A D/A converter and 50 motion vector detection circuits51 A frame memory and 52 A prediction mode switching circuit53 Operation part and 54 A prediction decision circuit and 55. A DCT mode switching circuit and 56 DCT circuits57 A quantization circuit and 58 variable-length-coding circuits59 A transmission buffer and 60 An inverse quantizing circuit61IDCT circuit and 62 A computing unit and 63. A frame memory64 motion compensation circuitsand 81. A receive buffer and 82 A variable length decoding circuit83 An inverse quantizing circuit84 IDCT circuitand 85 [********.] A computing unit86 frame memories87 motion compensation circuitsand 101 A transformer coder and 102 A decoding devicea 103 encoding-parameter multiplexera 105 encoding-parameter decollatorand 106 **106 SDTIand 111 [A transformer coder and 132 / A decoding device and 133 / Coding equipment134 motion detection parts and 135 / Coding part] A decoder and 112 A variable length decoding circuit and 121 An encodera 122 encoding-parameter controllerand 131